Capsicum newsletter

Number 5

1986

Edited by

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D E C E M B E R 1 9 8 6

The picture in the cover is derived from the

“Herbario nuovo di Castore Durante”,

Venetia, MDCXXXVI

FOREWORD

Fifth ‘‘Capsicum Newsletter’’ issue is published some months late as regards our expectations: organizing difficulties prevented us from being more prompt. Starting from next issue, we hope to publish regularly within the end of the year.

As you can see in following tables and geographical maps, ”Capsicum Newsletter” can boast a great number of contributions this year as well; meanwhile the circulation is more and more extensive.

The flavor met by the publication was confirmed by the debate held in Zaragoza during the EUCARPIA Meeting on Capsicum and Eggplant. On that occasion, financial problems were examined. They are still unsolved and very urgent. For this reason we will be obliged, in the future, to reshuffle the ‘Capsicum Newsletter’ distribution. We are looking for a satisfactory solution to overcome this financial gap and, expecting for making it concrete, we ask the co—operation of private or public bodies able to supply us some help.

At Zaragoza the usefulness of “Capsicum Newsletter” was outlined as official information organ for the “Capsicum and Eggplant” group of ‘Vegetables’ EUCARPIA section. We are very proud of it.

As for the past, none of the contributions published have been modified, even when the text had to be retyped. Therefore the Authors only must be held responsible for the scientific content of the reports.

At the moment we are working to establish an international scientific committee charged with the supervision of the “Capsicum Newsletter” and we hope to put it into operation as soon as possible.

In any case we are glad to contribute to the information exchange between research workers dealing with pepper all over the world, so that we contribute to the scientific progress in the food crops field.

Piero Belletti, Maria Ornella Nassi, Luciana Quagliotti

Turin, 30th April 1987

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EUROPE (20 countries)

- Italy	84	
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- Yugoslavia	5	
- Greece	4	
- Romania	3	
- West Germany	3	
- Austria	2	
- Poland	2	
- Norway	1	
- Portugal	1	
- East Germany	1	
- Switzerland	1	(total 322)

AFRICA (6 countries)

- Tunisie	5	
- Nigeria	4	
- Ethiopia	4	
- Algeria	1	
- South Africa	1	
- Ivory Cost	1	(total 16)

OCEANIA (2 countries)

- Australia	5	
- New Zeland	1	(total 6)

AMERICA (14 countries)

- U.S.A.	70	
- Brazil	19	
- Cuba	10	
- Costa Rica	7	
- Mexico	7	
- Columbia	5	
- Argentina	4	
- Peru	4	
-Guatemala	3	
- Chile	2	
- Bolivia	2	
- Canada	2	
- Martinica	1	
- El Salvador	1	(total 173)

ASIA (12 countries)

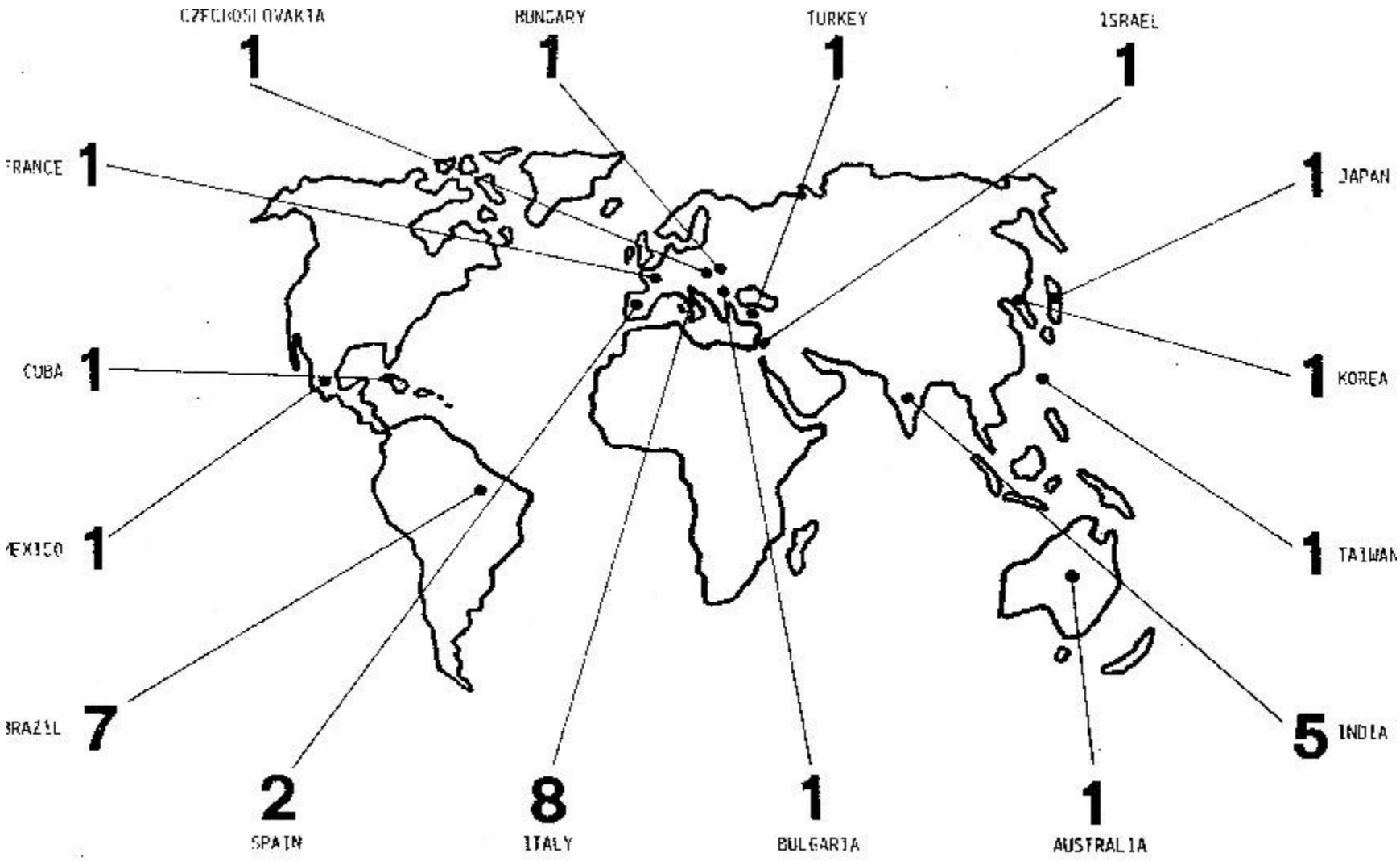
- India	56	
- Japan	15	
- Taiwan	8	
- Korea	6	
- Israel	4	
- China P.R.	2	
- Malaysia	2	
- Labanon	1	
- Sri Lanka	1	
- North Yamen	1	
-Philippines	1	
- Thailandia	1	(total 98)

IN ALL: 54 countries and 579 research workers

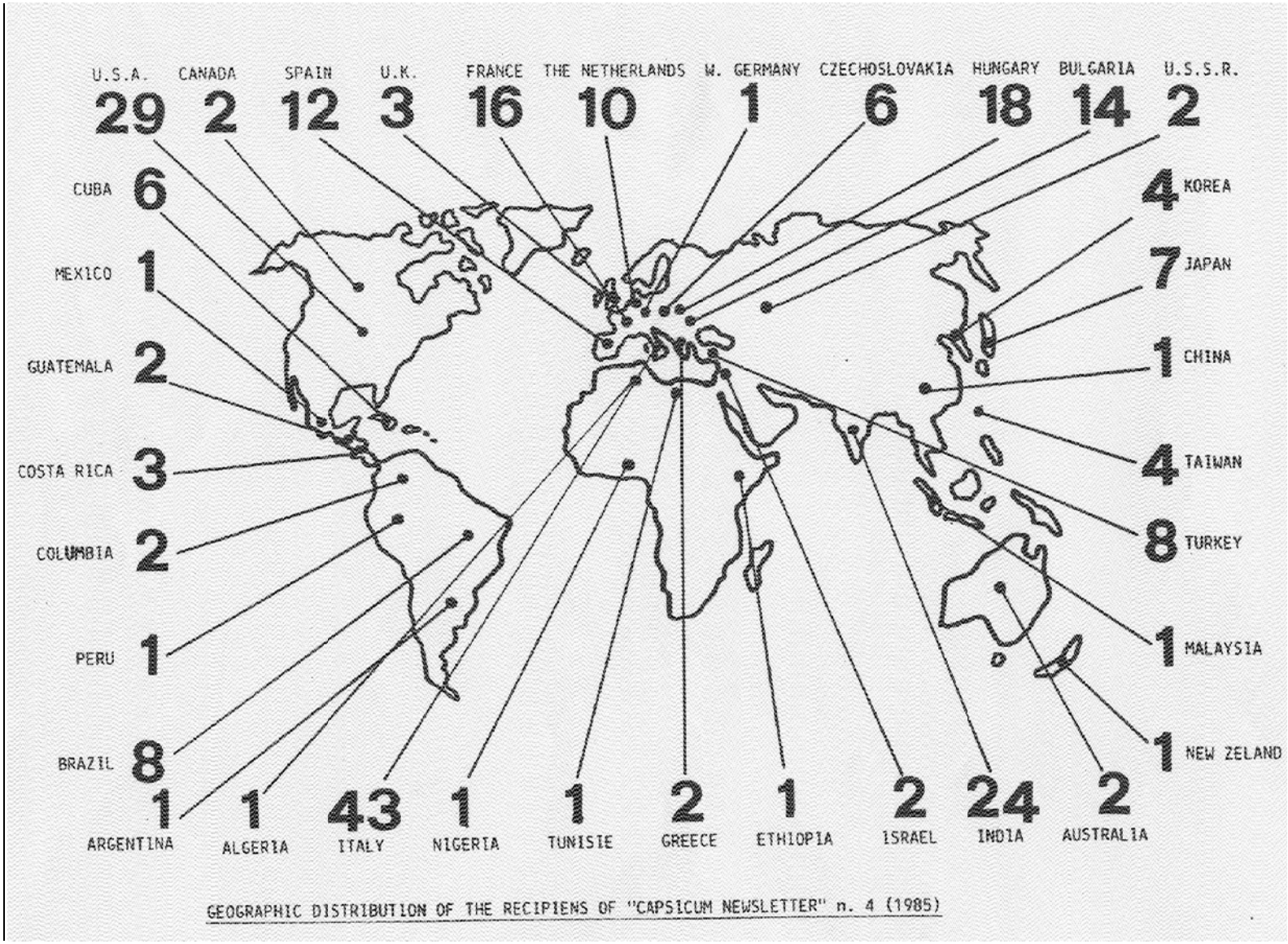
NUMBER AND GEOGRAPHIC DISTRIBUTION OF THE RESEARCH WORKERS CONTACTED BY THE EDITORIAL STAFF OF “CAPSICUM NEWSLETTER”

ISSUE	1/1982	2/1983	3/1984	4/1985	5/1986
CONTRIBUTIONS	40	57	34	45	34
CONTRIBUTORS	55	85	51	76	57
RECIPIENS	97	179	184	240	-

NUMBER OF CONTRIBUTIONS, CONTRIBUTORS AND RECIPIENS OF THE FIVE ISSURES OF “CAPSICUM NEWSLETTER”



GEOGRAPHIC DISTRIBUTION OF THE CONTRIBUTIONS TO "CAPSICUM NEWSLETTER" N. 5 (1986)



GEOGRAPHIC DISTRIBUTION OF THE RECIPIENS OF "CAPSICUM NEWSLETTER" n. 4 (1985)

LIST OF AUTHORS

LIST OF CONTRIBUTIONS

COLLECTION OF WILD CAPSICUM IN BRAZIL

E. Lleras and L.B. Bianchetti

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In 1985 CENARGEN/EMBRAPA, in collaboration with IBPGR, initiated a three year program for the collection of wild Capsicum species in Brazil. The 1985 campaign covered the states of Paraná, Santa Catarina, Rio Grande do Sul and part of São Paulo, with the participation of Drs. Armando Hunziker (Universidad de Córdoba, Argentina) and Vicente Casali (Universidade Federal de Vicosa, Brazil) and Mr. Glocimar P. da Silva, under the leadership of the first author.

The 1986 expedition covered the states of Minas Gerais, Espirito Santo and Rio de Janeiro, linking up, in São Paulo, with the route followed the previous year. Participants were as in 1985, with the addition of the second author, who led part of the expedition.

To present, ca. 15.000 km were covered, yielding germplasm of 229 accessions representing 64 distinct populations.

A total of 13 probable species were found, 10 of which are totally wild. Four taxa are almost certainly new to science.

These collections from southern Brazil are invaluable, as they definitely prove that a major center of variation for the genus occurs in the older geological formations of the coastal mountain ranges. Further coverage of this area is urgently needed, as human disturbance is rapidly destroying the habitats where Capsicum is known to grow.

The third phase will take place in March-April of 1987, and will cover the Brazilian Amazon, with the team being formed by the above cited, plus Dr. Barbara Pickersgill (University of Reading, U.K.).

Further details, plus information on availability of germplasm and herbarium material, may be obtained from the authors.

CHROMOSOME STRUCTURAL DIFFERENTIATION BETWEEN CAPSICUM ANNUUM VAR. ANNUUM AND C. CHINENSE

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As reported previously by Egawa and Tanaka (1984b), the meiosis of intravarietal hybrids of cultivated C. annuum var. annuum was very regular and 12 bivalents were formed at the first metaphase (MI). This cytological relationship was also observed in the local races from Japan as well as in the collections from the New World. The chromosomes of C. chinense, another cultivated species of chili peppers, is also considered not to be structurally differentiated (Egawa and Tanaka 1984a; Egawa, unpublished). Intraspecific hybrids of C. chinense examined also showed a normal chromosome pairing of 12 bivalents at MI.

Chromosome pairing of interspecific hybrids between the cultivated forms of C. annuum and C. chinense, however, was irregular with a quadrivalent formation. As presented in Table 1, depending upon the hybrid combinations, 24.0 to 39.5% of PMCs examined cytologically showed the configuration of 1 quadrivalent + 10 bivalents. Most of the remaining PMCs had the configuration of 12 bivalents. In that case, two of the bivalents were hetromorphic.

From the present results, it is evident that the two species of cultivated chili peppers, C. annuum var. annuum and C. chinense, differ from each other by one reciprocal translocation. The occurrence of univalents was relatively rare as presented in Table 2. Aside from the difference by one reciprocal translocation, the genomes of C. annuum var. annuum and C. chinense are basically homologous with each other as indicated by the tow number of univalents.

Egawa, Y. and M. Tanaka. 1984a. Cytogenetical relationships among three species of chili peppers, Capsicum chinense, C. frutescens and C. baccatum. Japan. J. Breed. 34:50-56.

Egawa, Y. and M. Tanaka. 1984b. Structural differentiation of chromosomes by reciprocal translocation in Capsicum annuum. Japan. J. Breed. 34:445-450.

Table 1. Chromosome pairing at MI of F_1 hybrids between cultivated forms of C. annuum and C. chinense.

Chromosome pairing				No. of cells observed		
I	II	III	IV		131	8268
	12			68 (68.0%)	25(58.2%)	24(60.0%)
2	11			3(3.0)	1(2.3)	
4	10	1		2(2.0)		
1	10			1(1.0)		
	10		1	24(24.0)	17(39.5)	15(37.5)
2	9		1	1(1.0)		1(2.5)
3	9	1		1(1.0)		
				Total 100(100.)%)	43(100.0%)	40(100.0%)

Table 2. Average frequency of chromosome pairing and percentage of pollen stain ability of F_1 hybrids between C. annuum var. annuum and C. chinense.

Hybrid No.	Cross combination	No. of cells observed	Chromosome pairing					Pollen stain-ability
				II				
			I	Ring	Rod	Total	IV	
107	3412(a) x 3556(c)	100	0.17	6.42	4.95	11.37	0.25	21.8%
131	3730(c) x 3439 (a)	43	0.05	8.63	2.56	11.19	0.40	0.0
8268	4140(a) x 4108(c)	40	0.05	7.50	3.68	11.18	0.40	-

Note: a and c in parentheses denote C. annuum var. annuum and C. chinense, respectively.

FIRST RESULTS OF A RESEARCH INTO THE FREQUENCY OF CHROMOSOME ABERRATIONS IN Capsicum annuum L. SEEDS SUBJECTED TO DIFFERENT AGEING TREATMENTS

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The aim of the present work is to survey the possible existence of a relationship between loss of viability of

sweet pepper seeds and appearance rate of genetic abnormalities that can be observed through direct cytological examination.

Materials and methods

Seeds of sweet pepper cultivar 'Super Golia Giallo', having the following initial characteristics were used in this research:

1000 seed weight: 6.59 g
seed moisture
(% on fresh weight): 5.61
percentage of germination:82.4

The 4 'ageing treatments':

	Temperature (°C)	Relative Humidity %
n.1	40	100
N.2	35	76
N.3	30	76
N.4	30	55

Four ageing treatments, differing in severity, were arranged in order to obtain various rates of seed deterioration; germination tests were periodically carried out: two hundred seeds were used in each test on each treatment and 20 root tips (5-6 nun long) were collected, stained according to Feulgen technique arid observed at the microscopy. Fifteen late-anaphase configurations were examined in each root tip and they were scored as 'normal' or 'aberrant', the latter in case bridges or fragments were present.

Results and Discussion

Tables n.1 to 4 show the data so far obtained. All the ageing treatments here adopted cause a trend toward an increase in aberration with decrease in percentage of germination (PC) of seeds, but the less severe treatment is giving the highest percentage of aberrant cells. In fact, even if after about 9 months' storage the loss in geminability has been about 10% only, the frequency of aberrant cells is higher than that found in seed samples stljected to one of the less severe treatments (even at lower PC). In one of the last examinations, one single root tip caning from treatment n.4 showed 38% aberrant configurations out of the whole anaphases present. The highest percentages of aberrations found in treatments n.1, 2, and 3 correspond to a PG between 40 and 50; at least in treatment n.3, a further loss of viability is accompanied by a decline in the frequency of aberrant cells. The higher frequency of abnormalities in slowly deteriorated seeds than in rapidly deteriorated ones has been previously reported, in particular by HARRISON (1966) who states that in slowly deteriorated lettuce seeds "the association of chromosanal damage with decreasing germination is.. .great between 9~P6 and 7~ germination"; he often found up to 80% aberrant cells in a single lettuce root tip and he affirms that seed samples showing the same PC may have reached a different level of deterioration.

The existence of a mathematical relationship between seed viability and percentage of aberrant cells has not yet been investigated in the present work.

As far as the kind of nuclear damage is concerned, aberrant sweet pepper mitotic cells showed single or double bridges, while very few of them contained more than two mutations; sane acentric fragments were observed too, a few of them were single, while the majority consisted of double fragments, suggesting that the unsplit chromosane underwent the breakage.

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Table n.1 — Temperature: 40°C — R.H. 100%

PG	75.6	71.7	61.3	58.2	52.2	52.8	46.3	26.6	19.7	7.6
% ab. cells	1.0	0.3	2.3	1.6	1.6	3.3	6.3	4.6	4.6	4.4

Table n.2 — Temperature: 35°C — R.H. 76%

PG	69.4	61.2	41.9
% ab. cells	1.3	2.6	4.1

Table n.3 — Temperature: 40°C — R.H. 100%

PG	66.8	47.5	33.0	13.5	2.5
% ab. cells	0.6	4.3	3.0	2.6	2.2

Table n.4 — Temperature: 30°C — R.H. : 55%

% ab.	82.4	77.3	81.0	71.9	75.6	78.5	71.5	70.9	70.4	71.5	73.4	67.8	71.1	76.1	67.0	76.4
cells	0	0.3	3.3	2.3	3.0	1.6	2.3	5.0	5.3	99.3	5.0	4.3	3.6	6.0	8.6	6.6

‘LUESIA’ (INIA 225), A SELECTED PEPPER CULTIVAR FOR PROCESSING [(1)]

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‘Luesia’ was obtained by pedigree selection from the land variety ‘Morrón de Conserva’, and for this reason they are very similar, although ‘Luesia’ shows a greater homogeneity. Some characteristics as tolerance to Potato Virus Y (PVY) and partial resistance to Verticillium dahliae Kleb. make ‘Luesia’ particularly interesting when compared to other selections of ‘Morrón’. Furthermore, ‘Luesia’ displays a greater resistance to fruit cracking and a better fitness for once over harvesting.
First results on the performance of ‘Luesia’ with PVY were obtained on studying a collection of varieties grown outdoors in the areas of Murcia and Valencia (LUIS ARTEAGA et al., 1983). PVY, endemic in those areas, produced infections next or equal to 100 percent on sensitive varieties at the end of the growing season, while ‘Luesia’ and the resistant variety ‘Yolo Y’ were not or slightly affected. With the aim of confirming these results, a series of artificial inoculations were carried out in a climatized greenhouse with several PVY-O and one PVY-l strain (according to the terminology proposed by GEBRE SELASSIE et al. (1985)). Results confirmed ‘Luesia’ as a tolerant variety, showing mild mosaic and a manifest delay in symptom onset as compared to sensitive varieties (LUIS 4RTEAGA and GIL ORTEGA, 1986).
Partial resistance to V. dahliae has been observed in ‘Luesi’ when artificially inoculated in 1979 (PALAZON et al., 1980) Later on, ‘Luesia’ was pedigree selected during five consecutive years in a plot heavily infected with that parasite. Either healthy plants or plants displaying mild symptoms (i. e. slightly wilted but without defoliation, necrosis or reduction of plant size) were selected. Trials in the same plot have shown that two lines selected as above have not given a higher production though they have evidenced a smaller incidence of symptom onset than ‘Luesia’ which showed a similar resistance to that ‘Poderok Moldovy’.

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LUIS ARTEAGA M. and GIL ORTEGA R., 1983, Natural virus infection in different pepper varieties in Spain. 5th Eucarpia Meeting on Capsicum and Eggplant. Plovdiv (Bulgaria), p. 143—147.
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(1) Works presented here have been partially sponsored by CAICYT and INIA.

STUDY OF SWEET PEPPER ASSORTMENT FOR CANNING

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The sweet pepper /Capsicum annuum L./ quality has been studied in 28 cultivars in fresh as well as canned state. The following qualitative parameters were studied: contents and retention of L-ascorbic acid, B-carotene, appearance, color, consistency, odor, taste and overall character of the products. Based upon ten-year data on the production of sterilized vegetable-garden paprika in the Slovak Socialist Republic, the average proportion of products prepared from biologically ripe vegetables was determined /24.4%/. An average L-ascorbic acid retention of 47.7% was found in the sterilized products. In sensory evaluations of sterilized products in the biological ripeness state, the “Ambra”, “Morava”, “Fehérözön” and “Szarvasi” cultivars showed best results. Most suitable cultivars at the ten-year evaluation of products sterilized in the state of biological ripeness were the “Citrina”, “Frukts”, “Jubilantka”, and “Moravoa”.

KOPEC K., 1985, Evaluation of Suitability of Vegetable-garden Paprika for canning. Vedecké práce VŠUZŠP Hurbanovo, 4: 53-63.

K0PEC K., VALŠIKOVÁ M., 1984, Ripening of Tomatoes and Sweet peppers and their evalution. ISHS Symposium “Quality of Vegetables”, AS, Norway.

VALŠÍKOVÁ M., 1983, Evaluation of the Genetic Potential of Sweet Garden pepper Assortment. Sbor. UVTIZ - Zahradnictví, 10, /2/ : 151-156.

Table 1. Sensory evaluation of sterilized pepper in the biological ripeness state
A – appearance and color, B- uniformity and shape, C – consistency, D – odor, E – taste, F – overall character, G – overall number of points.

1 – number of points, 2 – order of cultivars.

Cultivars	A		B		C		D		E		F		G	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
“Ambra”	14,18	1	12,54	1	7,63	3	8,36	2	34,90	2	8,81	1	85,18	1
“Frukta”	10,90	8	11,04	6	8,72	1	8,18	3	34,90	1	7,81	1	79,50	5
“Granát”	7,09	11	9,00	11	5,64	9	6,54	10	21,81	11	5,18	11	56,18	13
“Karmen”	14,18	1	11,18	5	7,09	5	7,27	7	29,09	5	7,27	7	76,09	7
“Morava”	12,54	5	11,18	5	7,81	2	8,00	4	33,45	2	7,72	5	81,00	3
“Perla” /tech./	10,50	9	10,63	7	5,63	9	5,45	12	21,09	12	5,09	12	56,59	12
“Perla” /boil./	11,72	6	9,54	10	6,72	6	6,90	8	24,72	8	6,45	10	65,90	10
“Budai csípös”	11,45	7	9,54	10	6,54	7	6,18	11	25,54	10	5,18	11	59,72	11
“Budai édes”	13,09	3	11,59	3	7,45	4	7,63	6	31,27	4	7,36	6	78,81	6
“Fehérözön”	13,36	2	11,72	2	7,45	4	7,90	5	31,24	4	8,18	2	80,00	4
“Podarok Moldavy”	13,36	2	10,36	8	6,54	7	6,54	10	26,18	7	6,72	9	68,18	9
“Szarvasi”	13,36	2	11,45	4	7,63	3	8,54	1	32,72	3	8,00	3	82,51	2
N6	12,81	4	9,81	9	7,09	5	6,90	8	27,63	6	6,90	8	72,18	8
P3 /tech./	5,72	12	6,00	12	4,72	10	3,63	13	10,18	13	2,81	13	32,00	15
P4 /boil./	7,36	10	5,45	13	5,81	8	6,72	9	24,00	9	5,09	12	53,36	14

AN INTERESTING STERILE VARIANT IN CAPSICUM

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Spontaneous varations in cultivated forms of Capsicum are common (Murthy 1961, Murthy et al. 1962, 1980).

This communication deals with three variants identified in G_4 chilli population during 1985-'86. The plants were normal with respect to height, spread and leaf characters (Fig. 1). However, the flowers were completely replaced by light green, sterile branched appendages (Fig. 2) with spirally arranged scale leaves.

The grafting experiments for the transfer of this feature and attempts for vegetative propagation have yielded no satisfactory result. As it could not be transmitted, it might not be due to virus or aphids. Since the plant protection measures were same as in other blocks, it could not be due to insecticide sprayings. Anatomical studies are in progress to assess the origin of these structures.

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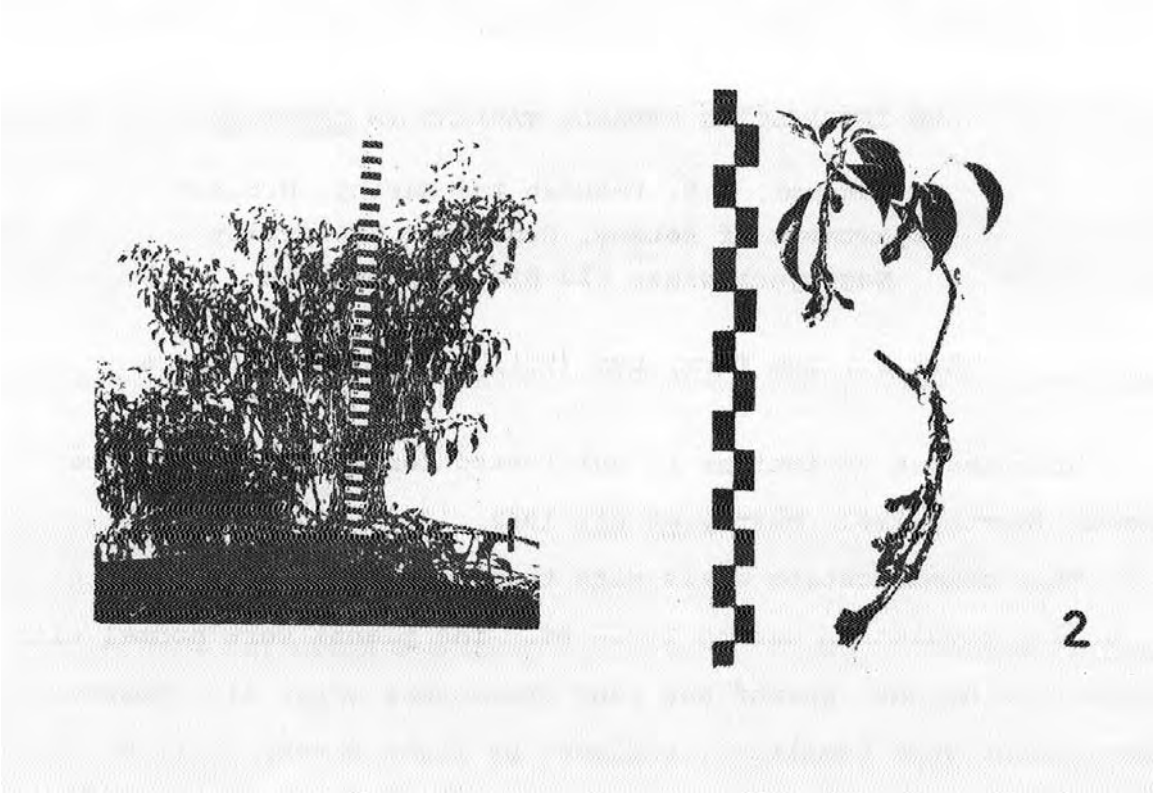

Caption of the Pictures

Fig. 1 – The variant plant

Fig. 2 – The sterile appendage

DEEP-FREEZING STORAGE OF PAPRIKA POLLEN

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Pollen of three paprika varieties was stored under deep freezing conditions over 10 and 46 mouths. The flowers were picked in August, and. the pollen grains were collected after one day drying of the flowers. Pollen grains of 30-34% water content were put directly into liquid nitrogen at -196 °C and into Kelvinator freezer at -76 °C.

Paprika pollen conserved well its vitality and fertility after long term deep-freezing storage. The best pollen tube growth was observed in sugar solution of 9 % sugar content /10 % with ‘Soroksári hajtatco’variety/. In 3% or 6% sugar solution tube growth of stored pollen was poor, although tube growth of fresh pollen was fairly good at this sugar concentration, too.

30 to l00 percent of the emasculated flowers were properly fertilized with the cold-stored pollen and the developed fruit showed the typical characteristics of the variety. Fruit size and seed yield were somewhat smaller with cold stored pollen fertilization as compared to F obtained after fertilization with fresh pollen /Table 1/. F_1 obtained with cold-stored pollen showed high individual variation in fruit size and number of seeds. The seeds of the hybrids were excellent in vigor and germination capacity. Progeny did not show any abnormality in growth and development.

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Fertilizing ability of deep-frozen paprika pollen

Budapest – Martonvásár

1982 – 86.

Crossings	Fruit set	Fruit size		Seed	
	%	Mm	G	Piece/fruit	1000 seed weight g
x					
H x S_196	100	108	14	47	7,49
H x S_f	40	121	28	128	7,24
S x S_196	57	104	45	57	8,46
S x S_f	65	92	41	62	8,84
xx					
R x Fö_196	80	89	26	110	7,4
R x Fö_76	90	87	29	60	7,7
R x Föf	60	74	20	4382	8,1
Fö x $Fö_{-196}$	40	81	46	57	6,0
Fö x Fö_76	30	73	67	65	6,8
Fö x $Fö_f$	40	72	34	65	6,2
H x H_76	60	109	20	60	6,7
H x H_f	60	110	17	70	7,9

Fö = ‘Fehérözön’
H = ‘Hatvani hajtatási”
R = ‘ “R” törzs
S = ‘Sorksári hajtató”
-196 = pollen stored at –196 °C
-76 = pollen stored at –76 °C
f = fresh pollen
x = pollen stored for 10 months
xx = pollen sored for 46 months

BREEDING BELL PEPPERS FOR SUMMER

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Cultivation of bell peppers is mostly confined to cooler seasons (26±3% °C maximum and 15±2.8°C minimum) in the plains of South India. To increase its availability during summer, when fruits are seldom seen in the markets, efforts are underway to develop genotypes capable of performing well during February-June (34±2.5°C maximum and 19.5±2.1°C minimum).

During summer 1985, seven of the entries yielded significantly higher than the check, ‘California wonder’ (Table-1). Two of these lines, ‘IHR-571’ and ‘IHR 632-1’ also had the advantage of larger fruit size.

Sixteen out of fifty one lines when grown during August -December the interaction of seasons x lines worked out through factorial R.B.D. was significant indicating that the performance of lines during the two seasons were different. This necessitated breeding bell peppers separately for summer. When 45 lines were evaluated in summer of 1986, seven of the lines again outyielded ‘californta wonder’ (Table-1). Single plant selections have also been carried out, studies on the differential response of genotypes during the two seasons is presently under investigation. Since viruses takes a heavy toll of the crop during summer, breeding for resistance to viruses is also being attempted.

Table 1. Yields of some bell pepper lines during February-June season

Lines	1985		1986	
	Yield (g)	Average fruit weight (g)	Yield (g)	Average fruit weight (g)
'IHR 61-1'	433.0	39.4	464.1	46.3
'IHR 213-1-2'	415.6	39.8	641.6	50.7
'IHR 450'	456.3	41.9	602.4	49.9
'IHR 479-6'	301.3	38.6	382.7	40.2
'IHR 782-12'	195.6	37.4	290.5	35.6
'IHR 571'	668.3	49.6	641.5	56.4
'IHR 632-1'	482.0	50.9	465.3	49.7
'IHR 675'	305.1	30.5	413.6	34.8
'California Wonder'	209.7	36.8	258.6	35.7
Overall Mean	182.6	27.9	157.9	29.2
'F' Value	15.16**	9.81**	11.05**	9.6**
C.D. 5%	32.8	7.4	20.2	8.4
C.D. 1%	47.6	10.2	29.7	11.2
No. of lines tested433.0	51		45	

SELECTION OF PAPRIKA BREEDING LINES

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Lines were derived from crosses between brazilian cultivars of sweet pepper (Capsicum annuum) ‘,Avelar’, ‘Agronomico lOG,’ ‘BGH 18’ and ‘Pimiento’ From U.S.A. Selections for fruit and plant agronomic characteristics such as yield, plant architecture, fruit size and fruit color were done in F_7 generation. F_7 breeding lines were obtained by Single Seed Descent Method. Field trials were conducted with F_8 selected lines. Fruit characteristics of the best line selected (‘P-14-8’) are: 11.0 cm length; 5.1 cm width; 68 g average weight; 8.9 percent of pericarp dry matter; 6.5 percent in fresh weight of placenta; 5.3 percent in fresh weight of stalk plus calix; 1.2 percent in fresh weight of seeds; 82.3 percent in fresh weight of pericarp; 4.4 mm pericarp thickness; 2250 mg of Vitamin C per 100 g of powder immediately after drying; 27.5 percent of retention of Vitamin C; 862 mg of Vitamin C per 100 g of powder 120 days after drying and storing in dark jars; 0.765 (A_{460} nm) color; conical type; 3 locules; external surface completely smooth like ‘Pimiento’; excellent firmness; Pendent. Field trials comparing-l4-8’ line with cultivars that are being grown for paprika production will be conducted, This line (‘P-l4-8’) is the first achievement in order to attend paprika processing in Brazil which now is exporting to Europe. Studies are being conducted to determine the level of total oil content of fruits that may allow best retention of powder color, since Capsantine and Capsorubine are lipid soluble.(‘P-l4-8’) total oil content in percentage was 2.49. This value was obtained by storing ‘P-14-8 fruit powder under polietilene films permeable to oxygen.’P-14-8’ fruit powder was obtained mature fruits dried in tunnels of forced air at 65 °C, 10 hours, until final humidity of 5.0 percent.

BREEDING LINES OF SWEET PEPPER OBTAINED BY SINGLE SEED DESCENT METHOD.

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Green conical fruits of sweet pepper (Capsicum annuum) are the most important type of main markets in Brazil. Cultivars mostly grown in Brazil are resistant to TMV and PVY, which is the most important virus. Plant height of recently released cultivars reaches 80 cm which allow 10 to 20 harvests and long cycle. Single Seed Descent method has been proved to be successful to develop breeding lines in Several Self-pollinated crops. 'Agronomico 10G' a widely grown cultivar of Brazil was crossed with 'São Carlos', 'Inoeu', also Brazilian cultivars, and 'Pimiento Perfection' from USA. Parents included in crosses were fenotipically very related except' Pimiento Perfection'. 'Agronomico 10G is known to have a more complex genetic constitution since it was selected from crosses evolving hot pepper and some old brazilin land races. SSD was applied up to F_6 generation. Selections were done first in F_7 generation. F_8 selections were based on yield of field trials. Superior lines were compared with parents in field trials at

650 meters and 350 m altitude. Commercial traits as color; firmness; pericarp firmness and thickness; percent of pericarp weight were also evaluated. Plant height, first branch insertion, and total number of branches were measured.

Only one line derived from the cross Agronomico 10G' x 'Pimiento Perfection' was selected. Total yield (kg/ha) varied from 16.766 ('S. Carlos') to 24.376 (Line 'P-9940') while 'Agronomico 10G' yield was 19.353. Ten lines among 152 F_8 selected lines were superior to the best parent 'Agronomico 10G' in both places, Fruit length and pericarp thickness which are important traits for fresh market, showed variability among F_7 generation and allowed selections to meet market needs, No differences among lines were founded as far as fruit width and number of branches. Variability of SSD derived lines and performance of selected lines from crosses of related parents indicate SSD as an alternative method for pepper improvement and rapid development of breeding lines.

RESULTS OF HETEROSIS BREEDING ON SWEET PEPPER (CAPSICUM ANNUUM L.)

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In the present study, the performance of 36 F_1 hybrids involving nine pure lines selected from diverse groups were compared to estimate the extent of heterosis for yield and its components. The material was planted at Experimental farm of Agricultural Research Unit Almora U.P. India in April 1981. Results revealed (Table) that the range and mean of F_1 hybrids was more than that of the parents in all, the characters except in days to 75% flowering and days to first picking because of late flowering and late maturity in F_1's, however, l0 and 21 crosses respectively were better than better parents. The best performing F_1 hybrids were in general better than their respective best parent. There was a complementary effect between early x early inbreds for lateness. There was fairly high degree of heterosis for early yield. In order of merit, 'Bullnose' x 'HC-201', 'HC-209' x 'Ruby King', 'Yolo Wonder' x 'Bullnose' hybrids appear to be best performing for total yield with 46.79%, 22.9% and 23.2% heterosis over best variety ('HC-201') respectively, one of the significant findings of the present study was that the crosses of poor x poor yielding parents showed the maximum heterosis over better parent, though their absolute mean yield was low as compared to high x high and high x poor yielding parent combination. It was also observed that almost in all, the hybrids, which showed the heterobeltiosis and standard heterosis for yield, at least one of the parent involved was outstanding for the trait Contributing to yield. This indicated that there was a strong tendency for higher gain to be transmitted from the parents to the off springs. It would, therefore, be worthwhile to exploit dominance components of the best crosses for early and total yield through heterosis breeding which is quite feasible in this crop due to its per hectare low seed rate, besides, high yield, disease resistant and improved quality attribute through favorable dominant gene combination and uniformity of produce due to genetic homogeneity are also of much importance. Heterosis for yield resulted from the combined heterosis for plant height, number of primary branches, fruit size, average fruit weight, early yield and number of fruit per plant.

Table 1 – Range and mean values in parents and F_1 hybrids and heterobeltiosis

Characters	Mean Parent		F_1	Top parent value	Best performing hybrid value	Average hetaerists percentage	Best heterotic hybrid combination and heterosis over better parent.	
Days to 75%	35.0	38.0	31.0	33.3	-6.4		‘HC-210’ x	-19.9
flowering plant	40.4	42.9	45.7	56.1	12.3		‘HC-201’	26.5
height (cm)							‘Bullnose’ x	
							‘HC-201’	
Number of	4.7	5.1	5.1	6.4	19.5		‘HC-209’ x	32.2
primary branches							‘Ruby King’	
Days to fist	55.1	55.5	51.0	51.0	-6.3		‘Golden Queen’	-21.5
picking							x ‘Bullnose’	
Early yield per	60.6	116.7	36.6	233.3	128.0		‘Ruby King’ x	243.6
plant (g)							‘California	
							Wonder’	
Length of the	8.4	9.4	10.5	14.0			‘Ruby King	41.2
fruit (cm)					15.7		x ‘Yolo	
							Wonder’	
Circumference of	17.1	17.9	20.8	23.9	10.4		‘Ruby King’ x	19.6
the fruit (cm)							‘Bullnose’	
No. of fruit per	32.7	27.8	25.3	11.3	-23.5		‘HC-209’ x	-67.3
(kg)							‘Golden Queen’	
Average fruit	31.9	38.8	39.3	90.0	34.6		‘HC-209’ x	136.8
weight							‘Golden Queen’	
Fruits per plant	11.7	16.6	18.6	27.8	69.5		‘HC-209’ x	162.6
							‘Ruby King’	
Fruit yield per	0.3	0.6	0.7	1.0	88.7		‘Yolo Wonder’	164.4
plant (kg)							x ‘Bullnose’	46.7
							‘Bullnose’ x	
							‘HC-201’	

HETEROT1C EFFECT IN SWEET PEPPER UNDER CUBAN CONDITIONS

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The heterotic effect was calculated as percentage of increment or decrement of the F_1 hybrids combinations over the parental mean and over the best parental.

The number of fruits per plant in all the hybrids showed high heterotic effect over the parental mean with an increment of 111-128%. Only in three of the six hybrids combinations were reported this effect for the mean fruit weight character with increments of 103-112%. All the hybrids showed heterotic effects of 116-126% for yield characters.

The heterotic effect over the best parental was reported in five of the six hybrids combination studied for the character number of fruits per plant and only in two of these for yield. This effect was no reported for mean fruit weight.

NATURAL CROSS-POLLINATION EXPERIMENT IN SPAIN IN 1986

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In south of Spain the most important pepper production area is in Almeria (land Andalucia), close to the see. The climate is arid, windy, hot and sunny, and therefore the pepper growing is in the plastic house, with drop irrigation.

This cross-pollination experiment was covered with net, but without plastic and therefore it was insect free practically. We used the same Hungarian and Bulgarian anthocyanin less lines (N°2. Fal - Fehérözön anthocyanin less, N°4. Sal - Soroksàri anthocyanin less, cv 'Albaregia', N°6. - Albena anthocyanin less) and the same Daskalov's genic male sterile line with Albene anthocyanin less marker gene (N°7. N°9. and N°11.), than in the Italian experiments in 1985/86. (Csillery et al.). The border variety was the 'Shamrock F_1'. All the 7 lines were transplanted in four repetitions, 3 rows/repetitions, 27 plants/ repetitions. From the fastigiated (determinate) Fal line (N°2.) was transplanted 54 plants/repetitions. The Aal ms-3 line was in three parcells (N°7. N°9. and N°11.) than in Italy in 1986. All the sterile plants were selected from one of the parcel (N°7.) and only the fertile plants remained (male sterile heterozygote), selected nothing from the other parcel (N°9.) but we signed the fertile (N°9F.) and sterile (N°9S.) plants, we selected all the fertile plants from the third parcel (N°1l.) and only the sterile plants remained, in autumn it was harvested all the red fruits from the best 9 plants/repetitions (4x9=36 plants/ anthocyanin less lines). The dates are in the Table 1.

In the fertile plants were 3,5 - 4,0 red fruits/plants, contrary in the sterile plants 0,3 - 0,4 red fruits/plants (with seeds!). in the fertile lines the cross-pollination was practically zero. in the N°9S parcels from the 36 plants we harvested 12 fruits only, with seeds and in the fruits were 213 seeds only. All of these seeds herites from fertile Aal plants, because in N°9 plot the Aal fertile (N°9F.) and the Aal sterile (N°9S.) plants were together. We signed in the Table 1. ncp = 0%, but it isn't correct data and later we shall modified all of the dates. In the Nil, plot from the 36 sterile plants we harvested 17 fruits with seeds, and in the fruits were 572 seeds, but 34,4% of seeds herited from $\underline{al^+}$ pollen ('Shamrock F_1') and from the other not allelic al lines, and 65,6% of seeds herited from Aal pollen, it seems to be in the general pollen background was dominant the Aal pollen. This data isn't correct too, because all of the seeds herited from cross pollination in the N.11. plots, and we shall correct this data too.

Table 1. Natural cross-pollination experiment in Almeria in 1986

Anthocyanin less lines	Transplanted plants	Harvested fruits from 36 plants	Seed fruit	Al seed	al^+ seed	Ncp %
2. Fal	216	135	117,3	14313	0	0
4. Sal	108	127	155,2	18557	1	0
6. Aal	108	149	90,3	11464	1	0
7. Aal ms-3^+ fert.	120	158	134,8	19579	1	0
9F. Aal ms-3^+ fert.	48	135	123,5	15419	0	0
9S. Aal ms-3 ster.	59	12	19,2	213	0	0
11. Aal ms-3 ster.	105	17	38,6	375	197	34,4

Al – anthocyanin less, green hypocotyls, yellow anther

Al+ - normal, purple hypocotyls and anther

Ncp % - natural cross-pollination per cent

Reference

CSILLERY, G. – SACCARDO, F. – UNCINI, L. – LEONE, A. CHIARETTI, D. 1986. Natural cross-pollination experiments in Italy VIth in Genetics and Breeding on Capsicum and Eggplant. Eucarpia - Zaragoza

NATURAL CROSS-POLLINATION EXPERIMENT ON PEPPER (Capsicum annuum L.) IN PIEDMONT, ITALY, IN 1986

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In 1986 seven experimental fields were set in different Italian regions, in order to survey natural cross-pollination (ncp) extent in Capsicum annuum L.; the northernmost experimental field was at Schierano (Asti), in Piedmont.
Three anthocyanin-lacking lines (Fal-Fehérözöri anthocyanin less; Sal-Soroksàri anthocyanin less, cv 'Albaregia'; Aal-Albena anthocyanin less), one genetic male-sterile and anthocyanin-lacking line (Aal ms-3 D), (the male-sterility source is Daskalov's 'Early of Krichim Fl'), and six cultivars with purple hypocotyl dominant character, were used.
A randomized block experimental design was adopted, with four replications for each tested line or cv.
Each replication consisted of 3 rows of 11 plants (distance among plants: 0.2 m; distance among rows: 0.7 m); the plants were transplanted in June.
Data collected in 1985 showed that the Aal ms-3 D plants had a far lower ncp percentage than the Aal plants, suggesting that a "screen effect" may have occurred between fertile and sterile plants, reached with difficulty by foreign pollen (or the Aol ms-3 D plants may produce more pollen, or a more competitive self-pollen than the other lines). In order to check this effect, the Aol ms-3 D line was in 3 parcels for each block in 1986: after flowering, only the fertile plants were left in the first parcel, only the sterile ones were left in the second parcel, while in the third parcel all the plants were left, but they were labelled.
The 20 best fruits of each parcel were collected at the end of September: their length and width were measured and all their seeds were extracted; a thousand seeds were sowed for each replication and they were scored as hybrid if the hypocotyl color was purple.
Both 'seed production per fruit' and 'ncp percentage' were lower in the experimental field of Schierano than in the average of the other fields (table n. 1) and they were lower too, than the values found in a previous research in Piedmont (FRANCESCHETTI, 1972).

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FRANCESCHETTI U. 1972, Natural cross pollination in pepper (Capsicum annuum L.) - EUCARPIA Meeting on "Genetics and Breeding of Capsicum", Turin, 16-l8September, p. 346-353.

Table n.1 Natural cross-pollination values in 1986.

Area \ Lines		Fal	Sal	Aal	Aal Ms-3+	Aal Ms-3+ F	Aal ms-3+ ms-3 S	Aal ms-3
Schierano	**Seeds/ fruit**	124	137	150	157	163	110	89
Average of 4 Italian areas		178	188	163	193	191	134	104
Schierano	**Ncp %**	2.1	2.3	2.2	0.9	1.6	31.4	39.7
Avarage of 4 Italian areas		5.2	4.2	3.3	2.1	2.4	41.5	65.1

ADDITIONAL POSSIBILITIES OF INTERESPECIFIC CROSSES OF CAPSICUM FRUTESCENS AND CAPS ICUM PRAETERMISSUM.

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Successful crosses of Capsicum frutescens and Capsicum praeterrnissum and the difficulties have been recently reported (Pundeva, 1984). Two brazilian accessions of both species were crossed. Both accessions of Capsicum praetermissum were not collected under cultivation and were founded in distinctive climatic and vegetation conditions. More recently it was collected a germplasm of Capsicum praetermissum which exhibit patterns of corola spots not yet observed. So, chances are of new possibilities for crossing these species what may be reported soon. Employing Capsicum frutescens as female parent, 'BGH l757' accessions crossed with both Capsicum praelermissum resulted in: seed germination of 22.4 percent to 77.4 percent and plant survival over 70.8 percent. Only 'BGH 1757' x 'BGH 1641' resulted in 3,5 percent of stainable pollen while 'BGH 2788' accession crossed with both Capsicum praetermissum no hybrid survived. Compared to Pundeva (1984) results there was an advance in terms of seed germination and pollen stainability. Concerning plant survival that author did not mention it. No backcrosses and no self pollination of hybrids were obtained. Employing Capsicum praetermissum as female parent maximum seed germination observed was 65.5 percent and none plants survived. This result did not add any advance to prior results obtained by Pundeva (1984) toward a better compatibility of both species. Still there is an agreement concerning more difficulty to cross these species if Capsicum praetermissum is employed as the female parent. The variability of Capsicum frutescens being more extensive Capsicum praetermissum must be explored to reach facilities over the study of compatibility of these species.

Pundeva, R., 1984, An addition to the list of possible interspecific crosses in Capsicum. Capsicum Newsletter, 3, p. 56.

CYTOLOGICAL STUDY OF F_1 HYBRID CAPSICUM ANNUUM X C. ANNUUM X C. PRAETERMISSUM

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A cytological study aiming to elucidate the cytogenetic interrelations between Capsicum annuum and C.praetermissum was made using the $F_{.1}$ hybrid C.annuum x C.praetermissum (3). Considerable disturbances were found in PMCs meiosis. At diakinesis instead of the expected 12 bivalents were observed average 8.81 bivalents per cell (Table i), of which only 2.62 ring, a sign for reduced chiasmata frequency. Occurrence of multivalent, mainly TRI- and quadrivalents implies the existence of structural differentiation of the parental genomes at least for 2-3 reciprocal translocations. In contrast to the PMCs meiotic behavior in F_1 hybrid C.annuum x C. baccatum (1) we observed constant presence of univalent. This is an indication for incomplete genome homology of the species studied. Significant abnormalities were also recorded in the remaining meiotic phases (Table 2), namely non-included chromosomes at metaphase I and II, laggards (26.29%) and chromosome bridges(6.90%) at. anaphase I and II. Presence of uni- and multivalents is a prerequisite for the appearance of a considerable number of unequal sized diads and tetrads and dropping out of chromosomes, resulting micronuclei and polyspores' formation. Along with typical pollen in the combinations with cvs 'Sivriya' and 'Royal purple' prevailed pollen of unusual clover-like shape. Pollen, fertility was very low. The results of our cytological observations are in accordance with the electrophoretic-ètudies of evolution in Capsicum (2) and demonstrate the existence of high distance and isolation barriers between C.annuum and C. praetermissum.

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3. PUNDEVA R., N.ZAGORSKA, 1982, Overcoming the incompatibility between C.annuum and C.praetermissum by the method of embryo-cultures. Symp.Remote Hybridiz., Sofia 1982, p.418.

Table 1. Chromosome pairing at daikinesis and metaphase I in F1 hybrid C. annum x C. praetermissum.

No. of cells observed		Chromosome pairing I	II Ring	II rod	II total	III	IV	V	VI	VII	Secondary association
D I A K I N E S I S											
141	Average	2,45	2,62	6,19	8,81	0,09	0,65	0,03	-	0,01	0,18
	Range	1-6	0-6	2-10	5-11	0-2	0-2	0-1	-	0-1	0-1
M E T A P H A S E II											
127	Average	2,81	1,97	6,26	8,23	0,20	0,62	0,02	0,02	0,01	0,21
	Range	1-8	0-5	2-10	4-11	0-2	0-2	0-1	0-1	0-1	0-2

Table 2. Meiotic abnormalities and pollen stainability in F1 hybrid C. annuum x C. praetermissum.

Analysed cells	MI	MII	AI	TI	Tetrads	Pollen stainablity
No. of cells observed	8007	2801	1464	4308	7156	
PMCs with disturbance	26,18	34,63	50,27	61,40	81,72	2,63

INCREASED PATHOGENICITY OF TMV PEPPER STRAINS AFTER REPEATED PASSAGES IN RESISTANT CAPSICUM ACCESSIONS.

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In order to study the behavior of single TMV pepper strains, each of them was repeatedly multiplied on resistant pepper cultivars under controlled conditions. In this way, it was possible to observe a development of the strains towards forms which progressively overcame the resistance governed by the L^1, L^2 and L^3-genes. It can be seen from the data in Table I that the pathotype P^1 strains initially overcame the resistance governed by the L^1-gene. Ader repeated multiplications, however, the strains began to cause both local necrotic lesions and systemic infection (top leaf mosaic) on Capsicum hosts with the L^2-gene. This stage is indicated as follows:

$P \longrightarrow P_{1\text{-}2}$

As they continued to multiply, the strains completed their evolution towards the $P_{1\text{-}2}$ pathotype and caused only systemic infection in hosts with the L^2-gene. The strains initially belonging to the $P_{1\text{-}}$ pathotype, which showed the tendency to evolve towards $P_{1\text{-}2\text{-}3}$, behaved in a similar manner.

Analogous evolutionary changes were also observed in our tomato strain, referred to as pathotype P_0. After repeated multiplications on susceptible pepper cultivars, this strain caused $systemic_0$ Infection as well as local necrotic lesions in the commercial hybrids L^0L^1 . This stage is indicated as $P \longrightarrow P_1$ The complete evolution of this strain towards the P^1 pathotype, however, has not yet been verified (i.e., the strain is still unable to overcome resistance to the L homozygote). Our strains $P^{1\text{-}2\text{-}3}$ have been also inoculated on C. chacoense P.I. 260429 plants; 4 the TMV pep. 3 still cannot overcome the resistance carried by the L-gene, producing a hypersensitive reaction. The TMV-pep. 1 produced systemic necrosis in some of the inoculated plants, followed by mosaic on the top leaves. Research is now in progress with a wide screening of this Capsicum accession to demonstrate whether or not TMV-pep. 1 is able to overcome resistance governed by the L^4 gene.

The research we have carried out from 1977 to the present on the relationships between resistant Capsicum accessions and TMV pepper strains, leads us to agree with Boukema (1980) as regards to the need to resort to new sources of resistance.

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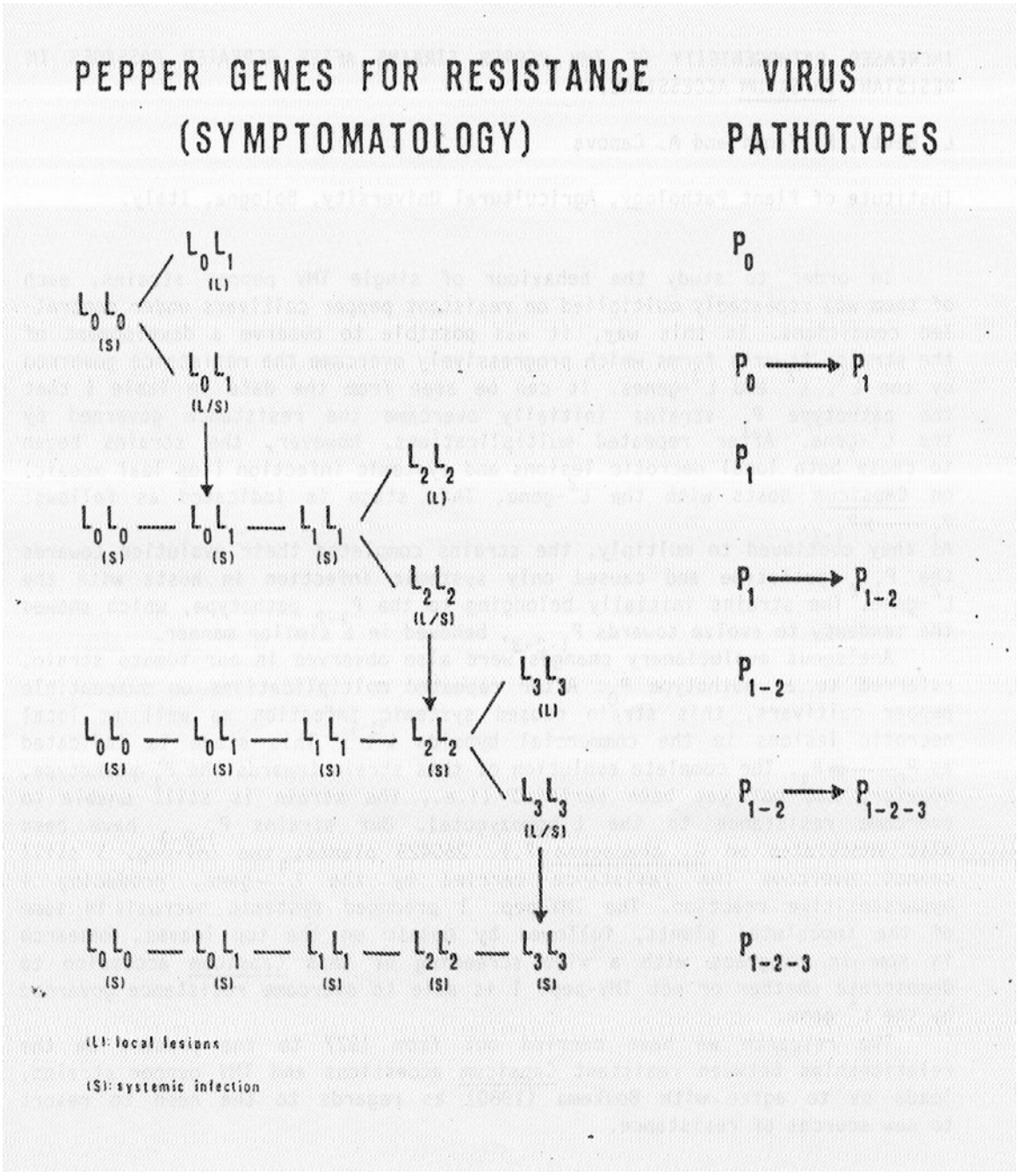
PEPPER GENES FOR RESISTANCE (SYMPTOMATOLOGY)
VIRUS PATHOTYPES
L_0L_1 (L)
L_0L_0 (S)
L_0L_1 (L/S)
P_0
$P_0 \longrightarrow P_1$
P_1
L_2L_2 (L)
L_0L_0 (S) — L_0L_1 (S) — L_1L_1 (S)
L_2L_2 (L/S)
$P_1 \longrightarrow P_{1-2}$
L_3L_3 (L)
P_{1-2}
L_0L_0 (S) — L_0L_1 (S) — L_1L_1 (S) — L_2L_2 (S)
L_3L_3 (L/S)
$P_{1-2} \longrightarrow P_{1-2-3}$
L_0L_0 (S) — L_0L_1 (S) — L_1L_1 (S) — L_2L_2 (S) — L_3L_3 (S)
P_{1-2-3}
(L): local lesions
(S): systemic infection

BEHAVIOR OF TWO COMMERCIAL PEPPER CVS. WITH L^1L3 GENOTYPE TOWARDS TMV PEPPER STRAIN INFECTION

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Two new commercial hybrids L^1L^3 (cvs. 'Novi' and 'Delgado') have been tested with a series of TMV pepper strains including one isolate belonging to the P_1 pathotype, 10 isolates belonging to the P_{1-2} pathotype, 2 isolates belonging to the P_{1-2-3} pathotype, PMMV, and finally P8 and P14 strains. The tests were carried out in a greenhouse during the summer, under similar conditions to those of normal pepper cultivation under glass. All the strains of the P_{1-2} pathotype caused the same type of symptoms: chlorotic mild mottling evolving towards necrosis and abscission in the inoculated leaves, followed by systemic necrosis and mosaic. This kind of syniptomatology was classified by Rast (1985) as partial susceptibility. Of the two cultivars tested, the 'Delgado' developed systemic necrosis on all of the plants, whereas some of the plants of the cv. 'Novi' showed a prevalent mosaic after the abscission of the inoculated leaves. The strains of P_{1-2-3} pathotype and PMMV produced only a weak systemic mosaic on both the cvs. Our results confirm those obtained by Boukema (1980): the resistance governed by the L^3-gene is not inherited in a completely dominant fashion. Research has been carried out to demonstrate whether the environment would influence the symptomatology, as already observed by Boukema (1980). The same methods as before were used, but, in this case, the plants were grown in artificial light (photoperiod 16 h) at l8°C. They showed similar symptoms, but these appeared more slowly and were less severe. The two cvs. tested in these conditions, did not get to the production stage in most cases, because the systemic necrosis caused their death when they were inoculated with P1-2 isolates, which are the most frequent in Italy. In fact, from 1977 to 1985, we found 18 isolates in infected pepper, 15 of which proved to belong to P_{1-2} pathotype, 1 to P_1 pathotype and 2 to P_{1-2-3} pathotype. Therefore, a doubt arises as to whether the commercial spread said hybrids is really valid. They have not been tested with the P_o pathotype (ToMV -and TMV type), but we must bear in mind that said pathotype is becoming less and less frequent in the samples of infected peppers.

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Research work supported by CNR, Italy. Special grant I.P.R.A.-Sub-project 1. Paper N. 1214

COMPARISON OF FLOWERING AND EARLY YIELD IN SUSCEPTIBLE AND RESISTANT PEPPER CVS. INFECTED BY A TMV PEPPER STRAIN

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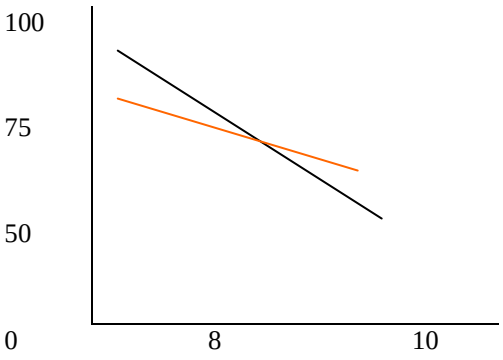
In order to evaluate the effect of TMV pepper strains on early crop growth, and flower and fruit development, 120 seedlings for each cv. 'XPH 833' (TMV susceptible) and 'NUN 3364' (TMV resistant) were inoculated with TMV-pep. 10 classified as P_{1-2} pathotype. 120 other seedlings for both cvs. were used as a control. The plants were then randomly transplanted in a PVC covered tunnel in 4 blocks (4 replicates per treatment). Buds, open flowers and fruits were recorded 8 and 10 weeks after the inoculation. The data were processed according to the Duncan test (Table 1). A flowering reduction was observed in both cultivars, as shown by the lower number of buds in the second recording.. This reduction was more accentuated In the resistant cv. than In the susceptible one. The interaction (control vs treated) x (resistant cv. vs susceptible cv.) was significant (Fig. 1).

In order to evaluate the effect of the virus on the early yield, the data obtained from the first two harvestings were recorded. The weight and the number of ripe fruits were recorded and reported in Table 2.The yield of the susceptible variety, inoculated with. TMW-pep. 10 decreased only in the second harvesting; the resistant variety inoculated with the same strain showed a yield reduction both in the first harvesting and in the second; the number of fruits was lower too. Besides, the loss of yield: compared to the control, was greater than in the susceptible cv. Previous research (Betti et al., 1984) has shown that the cvs. Sold as TMV reistant are, on the contrary, susceptible to the virus. The present work reveals, in addition, that the early yield, which is of greater commercial importance to farmers, decreases particularly.



Weeks after Inoculation
Verticle: % of buds

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Research work supported by CNR, Italy. Special grant I.P.R.A. –Sub-project 1. Paper .N. 1215

Table : Effect of TMV-pep. 10 inoculation on flower and fruit development.

Variety	Treatment	Time after inoculation (in weeks)	Avarage of the number per plant		
			Buds	Flowers	Fruits
'XPH 833'	Control	8	8,49	0,93	0,59
		10	25,53	2,83	3,04
	TMV-pep. 10	8	7,38	0,75	0,39
		10	18,73**	2,66	274
'NUN 3364'	Control	8	9,42	0,48	0,15
		10	38,06	2,43	0,49
	TMV-pep. 10	8	8,82	0,50	0,20
		10	22,96**	2,77	2,47

**: highly significant in comparison to the control of the same cy.

Table 2: Effect of TMV-pep. 10 inoculation on early yield.

Variety	Treatment	Time after inoculation (in weeks)	Avarage of the number per plant	
			Number of fruits	Weight (in kg)
'XPH 833'	Control	12	62,5	7,25
		13	38,25	5,05
	TMV-pep. 10	12	54,75	5,03
		13	22	2,09**
'NUN 3364'	Control	12	28,75	4,75
		13	67,5	8,9
	TMV-pep. 10	12	36,5	3,26
		13	23,5**	2,49**

* : significant in comparison to the control of the same variety

** : highly significant in comparison to the control of the same variety

Resistance to Cucumber Mosaic Virus (CMV)

and a linkage with small fruit sise

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A small-fruited accession of Capsicum annuum ('MRCH') was found tolerant to Cucumber mosaic virus (CMV). Following repeated inoculations in the greenhouse and a transfer to the field the plants demonstrated high level of tolerance with just mild mosaic symptoms. Standard backcrossing procedures were performed in order to transfer that level of resistance into "Bell"-type cultivars. Fruits of the resistant parent weigh 1.04 g while those of "Bell'- cultivars weigh around 150 g. As expected fruits of F_1 generation weighed close to the geometric mean and hence to the small fruited parent. Resistance to CMV was found polygenic. Following continuous backcrossing to "Bell"- cultivars and selection for CMV resistance we received in $B.C_2 F_2$ generation resistant individuals with mean fruit weight of 4.03 g and the heaviest had 5.58 g.

It is hypothesized that part of the many genes involved in small fruit size are linked with those responsible for CMV resistance. It is therefore unlikely that one can get "Bell", CMV - resistant cultivars out of that material.

BREEDING FOR MULTIPLE VIRUS RESISTANCE IN RED PEPPER (Capsicum annuum L.)

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'Pusa Jwala' is the first virus resistant red pepper cultivar released for general cultivation throughout India, it has given super high yield (Tewari, 1977) and has spread to foreign countries (Anonymous, 1983). 'Pusa Jawala' occupies largest area as cultivars to the red pepper cultivars planted in India.

Recently, a red pepper variety -'Delhi Local' has been reported to be immune to cucumber mosaic virus and potato virus-x; and tolerant to tobacco mosaic virus and. tobacco leaf curl virus (Konai and Nariani, 1983).

Selections have been identified fram the cross 'Pusa Jwala' x 'Delhi Local' which possess multiple virus resistance and. high yield potential, Sel.38-2-1, 96-4-9-3 and lul-2-33 possess tolerance against cucumber mosaic virus (CMV) tobacco mosaic virus (TMV) potato virus'-X(PV-X) and tobacco leaf curl virus (TMV). Selections 42-2-4 and 38-3-19 were found to be tolerant to CMV, PV-X and TLCV. Selections 96-4-8 and 81-1-1 were found to show tolerance against CMV and TLCV. Sels.96-4-9 and 811-1 were found to have tolerance against PV-X and TIJCV.

Since these selections possess virus resistance from diverse source genetic base they are considered of value in the event when 'Pusa Jwala' has succumbed to new virus strains (the resistance is said to be have broken down).

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WHITE FLY NEW VECTOR FOR VIRUS DISEASE IN SERRANO PEPPER

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In “Las Huastecas” region locate in the Northeast portion of Mexico the main problem of Serrano pepper are the virus diseases being *Myzus persicae* in it’s winged and wingless form the main vector from September to march where it founds the best temperature conditions for it’s development. The rest of the year the region is free from this insect.

From 1982, virosis incidence has increased and appeared sprouts in times *M. persicae* is away form the region. This increase is associated with the increase of the population density of white fly (probably *Bemisia tabaci*) specie who is present the whole year due to the great quantity of host plant is has both cultivated and uncultivated. Field observations made during four years indicates that white fly can be an important vector of virus diseases not necessarily from Cucumber Mosaic Virus (CMV) and Mottled Tobacco Virus (MTV). Same observations were made in the green house where we used fine mesh cages in which were planted twenty plants of Serrano pepper and in three different cages were confined *B. Tabaci, M. persicae* and a Cicadellidae (probably *Empoaoca sp*). associated insects to Serrano pepper that can be virus vectors because of it’s teed habits.

Results obtained from three tests show that white fly was the vector of virus in two of them, M. *persicae* in one and the Cicadellidae in name of them.

We are now making rigorous test that help us confirm what is assumed as a reality, that white fly is a virus vector in Serrano pepper.

RESISTANCE IN A PEPPER PLANT INTRODUCTION TO BACTERIAL SPOT AND BACTERIAL CANKER

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Plants of 'PI 271322' of C. annuum possess genes Bsl and Bs3 for hypersensitive resistances to races 2 and 1, respectively of the bacterial spot bacterium Xanthomonas campestris pv. vesicatoria (1,2). These genes are dominant and inherited independently (1).

Bacterial canker, incited by Clavibacter michiganense pv. michiganense occasionally defoliates peppers grown near infected tomatoes in Queensland, but is not usually a major disease problem. Canker became naturally incident in pepper varieties grown here in the 1985-86 summer. Most were severely defoliated. However, the line '271-4' derived from 'P1 271322' was almost completely disease-free.

Peppers 'Early Calwonder', its near-isogenic line 'l0 R' with gene Bsl, and line '271-4' were grown in a glasshouse. Leaves were infiltration-inoculated with low concentrations of two strains of the canker bacterium. Lesions developed by 10 days on 'Early Calwonder' and '10 R'. At 18 days the numbers of lesions and diameter per lesion were obtained for each line. Leaf discs from inoculated leaves were collected also at 18 days after inoculation. Bacteria were extracted by standard bacteriological methods to quantitatively assess population sizes. Data in Tables 1 and 2 are confirmation that line '271-4' of 'PI 271322' is resistant to bacterial canker, and that lesion density and size reflect bacterial multiplication.

The bacterial spot resistance gene Bsl in line 'l0 R'appears not to contribute to canker resistance (tables 1 and 2). The contribution, if any, of gene Bs3 to canker resistance, and possible linkage of resistance to the two diseases is being investigated.

Seed of line '271-4' of 'PI 271322' has been supplied to the United States Dept of Agriculture plant introduction center at Beltsville, Maryland, USA.

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TABLE 1. LESIONS PER 2CM^2 OF LEAF AND DIAMTER PER LESION OF PEPPER LINES INOCULATED WITH TWO STRAINS OF CLAVIBACTER MICHIGANESE PV. MICHIGANESE.

Bacterial Strain[a]	Lesions per 2 cm^2 of leaf			Diameter per lesion (mm x 10)		
	271-4	10 R	ECW	271-4	10 R	ECW
Cmm 0656	0.25±0.14[b]	6.2±0.83	9.5±1.07	3.3±1.08	6.9±0.60	6.9±0.48
Cmm 1079	0.17±0.12	23.8±1.07	12.7±1.05	4.5±0.71	6.5±0.37	7.1±0.46

a Inoculation concentrations were 0.78 x 103 cells/ml for Cmm 0656 and 1.50 x 103 cells/ml for Cmm 1079.

b Means ± standard error of mean.

TABLE 2. POPULATIONS OF BACTERIA PER CM^2 OF LEAF OF PEPPERS 271-4 AND 10 R EIGHTEEN DAYS AFTER INOCULATION WITH TWO STRAINS OF CLAVIBATER MICHIGANENE PV. MICHIGANESE.

	Bacteria per cm^2 of leaf	
Bacterial Straina	Host	
	271-4	10 R
Cmm 0656	3.04×10^3	8.11×10^6
Cmm 1079	9.20×10^3	3.45×10^7

A Inocula concentration were 0.78×10^3 cells/ml for Cmm 0656 and 1.50×10^3 cells/ml for Cmm 1079.

RECURRENT SELECTION FOR MULTIPLE DISEASE RESISTANCE IN CAPSICUM ANNUUM L. USING S_2 PROGENY TESTS.

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A random-mating population is being developed to constitute a germplasm pool for selection of multiple disease resistance in Capsicum annuum. Twenty sources (Table 1) with good horticultural type or high levels of resistance to one or more of the following pathogens: Xanthomonas campestris pv. vesicatoria, Phytophthora capsici, potato virus Y(PVY) and tomato spotted-wilt virus (TSWV), were entered in the first generation of random-mating. After a second generation of random-mating, a recurrent selection program based on S_2 progeny tests will be initiated. Because disease reaction can be evaluated prior to pollination, selected material can be intermated during the season of progeny testing. Thus, 3 generations per year will allow for one complete cycle of selection.

This population improvement scheme was chosen to allow for the expression of recessive and deleterious genes, prior to selection. Theoretical gain from selection is expected to be high due to the greater proportion of additive genetic variance accounted for with this method, in comparison to other recurrent selection methods. This experiment is being conducted without the aid of male-sterility. However, breeding programs may take advantage of male- sterility and natural out-crossing to facilitate recurrent selection within the Capsicum species, in the future.

Concurrent studies are investigating the inheritance of resistance to four subpathovar groups of Xanthomonas campestris pv. vesicatoria found in Brazil. The three resistant parents chosen for these studies are ‘CNPH 183’, ‘CNPH 187’ and’CNPH 703’.

TABLE 1. Genotypes of Capsicum annuum L. entered into germplasm pool for selection of multiple disease resistance.

CNPH Introduction no	Primary feature[1/]
90	Horticultural type, XCV
148	TSWV, PC
150	Horticultural type
181	Horticultural type
183	XCV
187	XCV
188	XCV
189	XCV
194	PVY
196	PVY
335	Horticultural type
617	PC
679	PVY, TSWV
695	XCV
703	XCV
732	TSWV
917	PC
1149	PC
1313	PC
1381	Horticultural type

[1/] XCV = indicates resistance to Xanthomonas campestris pv. vesticatoria

TSWV = indicates resistance to tomato spotted-wilt virus
PVY = " " " potato virus Y
PC = " " " Phytophthora capsici

SEARCH FOR CAPSICUM JUVENILE RESISTANCE TO BLIGHT CAUSED BY PHYTOPHTHORA CAPSICI

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Several reports are known of resistance breakdown in Capsicum germplasm resistant to Phytophthora blight, due to inoculations at a young host age. As part of our pepper multiple disease resistance program, we started a search for juvenile resistance in the Capsicum germplasm collection of the CNPH/EMBRAPA. Screening methodology for the detection of juvenile resistance may differ from the one determined for adult inoculation (Reifschneider et al., 1986). It is so necessary to evaluate how parameters like zoospore concentration and environmental conditions affect juvenile resistance. Tests evidenced that there are at least 2 lines ('CNPH 148' and 'CNPH 173') with known adult resistance, which also have some resistance at young age. These lines, however, do not seem to be uniform in this respect; the resistant reaction seems to increase linearly with host age, complete resistance being achieved after 40-47 days after sowing at 2l-25° (Fig. 1) Preliminary results also indicate that resistance is heritable. It should be possible to increase the level of resistance by within line selection.

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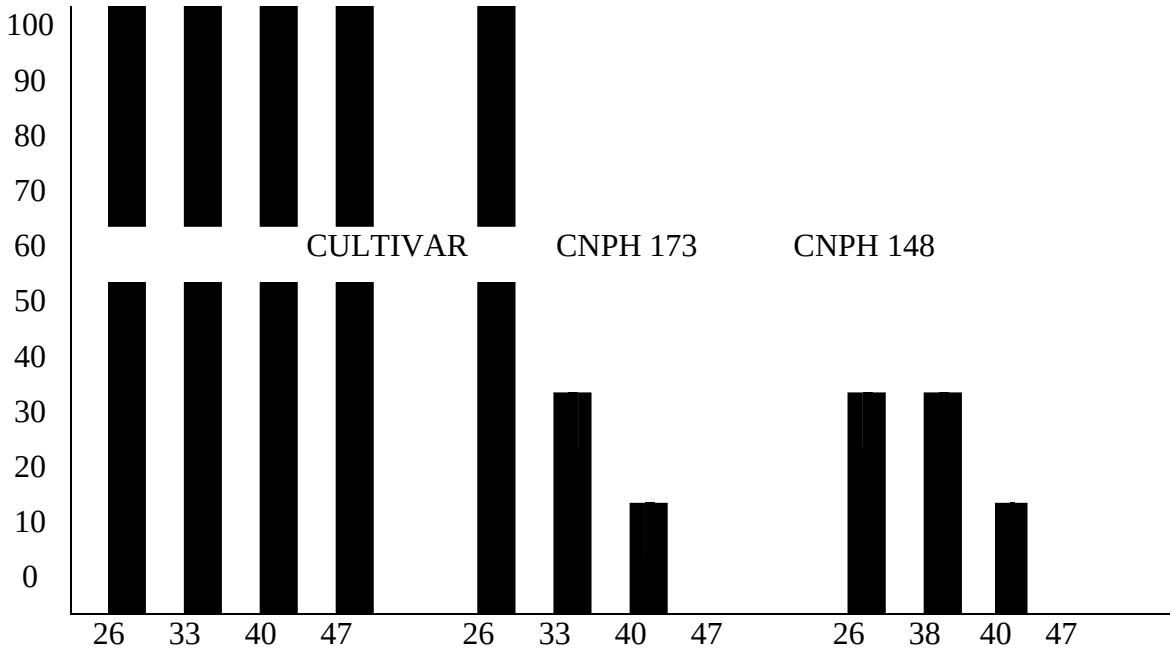
FIG 1. REACTION OF 1 BRAZILLIAN CULTIVAR AND 2 CNPH LINES TO INFECTION PY P CAPSICI IN 4 HOST AGES; HOST AGE IN DAYS AFTER SOWING; INOCULATION BY 3 ML ZOOSP. SUSPENSION AT PLANT BASE (5 X 10^4 ZOOSP. ML)



HOST AGE

VERTICLE: % DEAD PLANTS

EFFECTIVENESS OF ANTAGONIST AND FUNGICIDE COMBINATIONS FOR CONTROLLING PHYTOPHTHORA CAPSICI ON PEPPER.

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In the laboratory tests 12 antagonists and 4 fungicides were used. According to the results, m~st effective antagonists and their effectiveness axe, respectively: Trichoderma viride, Aspergillus flavus and Penicillium patulurn, and, 84,29 %, 81,78 %, 81.14 %. Results of the in vitro studies thiram, captan or manozeb and A. flavus were the promisee combinations against to P. capsici. On the other hand, thiram is the less effective chemical to the antagonists used.

In the pod studies it was seen that A. flavus + thiram combinations gave the best result (Table 1). In the field trials pepper plants were transplanted to naturally and heavily infested soil. A week before transp1anting, 50 g A. flavus cultured on the grains of some cereals were applied to the transplanting points determined before in the soil. Thiram application was done once to the root zones of each plant just after transplantation. According to the figures (Table 2), effectiveness of A. flavus + thirarn 2000 ug/mJ. increased untill the 95 days after transplantation.

Table 1. Effectiveness of A. flauvus + thiram combinations to P. capsici under pod conditions.

Combinations	Concentrations (ug a.i./ml)	Effictiveness (%)		
		Days after tansplantation		
		7.	15.	30.
A. flavus + thiram	3,0	42,85	42,85	28,57
	10,0	85,71	85,71	71,42
	30,0	100,00	100,00	100,00
Thiram	3,0	0,00	0,00	0,00
	10,0	14,28	0,00	0,00
	30,0	0,00	0,00	0,00
A. flavus	-	42,85	42,85	28,57

Table 2. Effectiveness of A. flavus + thiram combinations to the pathogen under field conditions.

Combinations	Concentrations (ug a.i./ml)	Effictiveness (%)			
		Days after tansplantation			
		65	85	95	117
A. flavus + thiram	3,0	0,00	0,00	0,00	0,00
	2000,0	50,00	53,00	66,00	25,00
Thiram	30,0	0,00	0,00	0,00	0,00
	2000,0	0,00	6,66	14,28	0,00
A. flavus	-	0,00	0,00	14,28	0,00

Studies on the inoculation methods for resistant varieties of red pepper to anthracnose

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Diseases of red pepper have been a serious problem in Korea. One of them, anthracnose has been known to cause severe damages to yield of pepper. Gloeosporium piperatum, Colletotrichum dematium and Colletotrichum nigrum are known as main pathogens of anthracnose in Korea. They infect to red fruits of pepper and G. piperatum to green fruit too. In order to obtain basic data for breeding of resistant varieties to anthracnose this study was done.

Varieties used in this experiment were ‘Jangsugochu’as a resistant variety, ‘Bosungjaerad, ‘Pyungchangjaerae’ and ‘B16-l0-l0’ as susceptible ones. After incubation with C. dematium in P.D.A medium the inoculum was prepared by dilution with distilled water and was adjusted to 15-20 spores under microscope 100X. After inoculated with 3 pins for effective inoculation environment the infected fruits were examined under different conditions; i) 95% RH condition ii) room condition iii) room condition following 95% RH condition for one day. Treatments of sprayer, one pin, 3 pins, 5 pins, and 7 pins for investigate to the effective inoculation method were done under 95% RH condition and the progress of the lesion on the infected fruits was examined daily for one week after treatment.

The symptom was recognized two days after inoculation and progressed most rapidly under 95% RH condition. In one or 7 pins inoculation, the incidence of infection was too slow or rapid to compare the varietal responses. But in 3 pins or 5 pins it was possible to compare the varietal responses because the symptom was significantly different. In conclusion, inoculation with 3 or 5 pins to the exocarp of fruit under 95% RH condition and examination 4 to 6 days after inoculation revealed to be appropriate method to identify the difference of the resistance to anthracnose.

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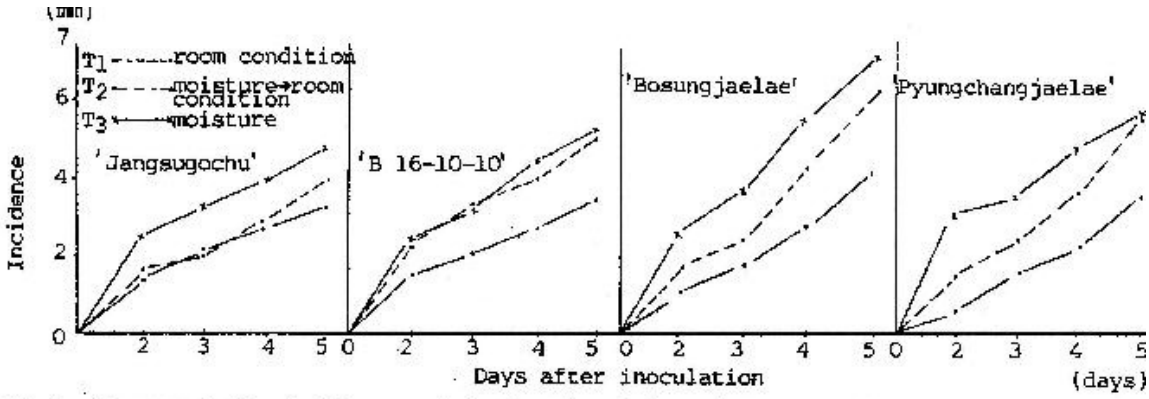

Fig. 1. Changes in the incidence of C. dematium infected fruits under a few conditions.

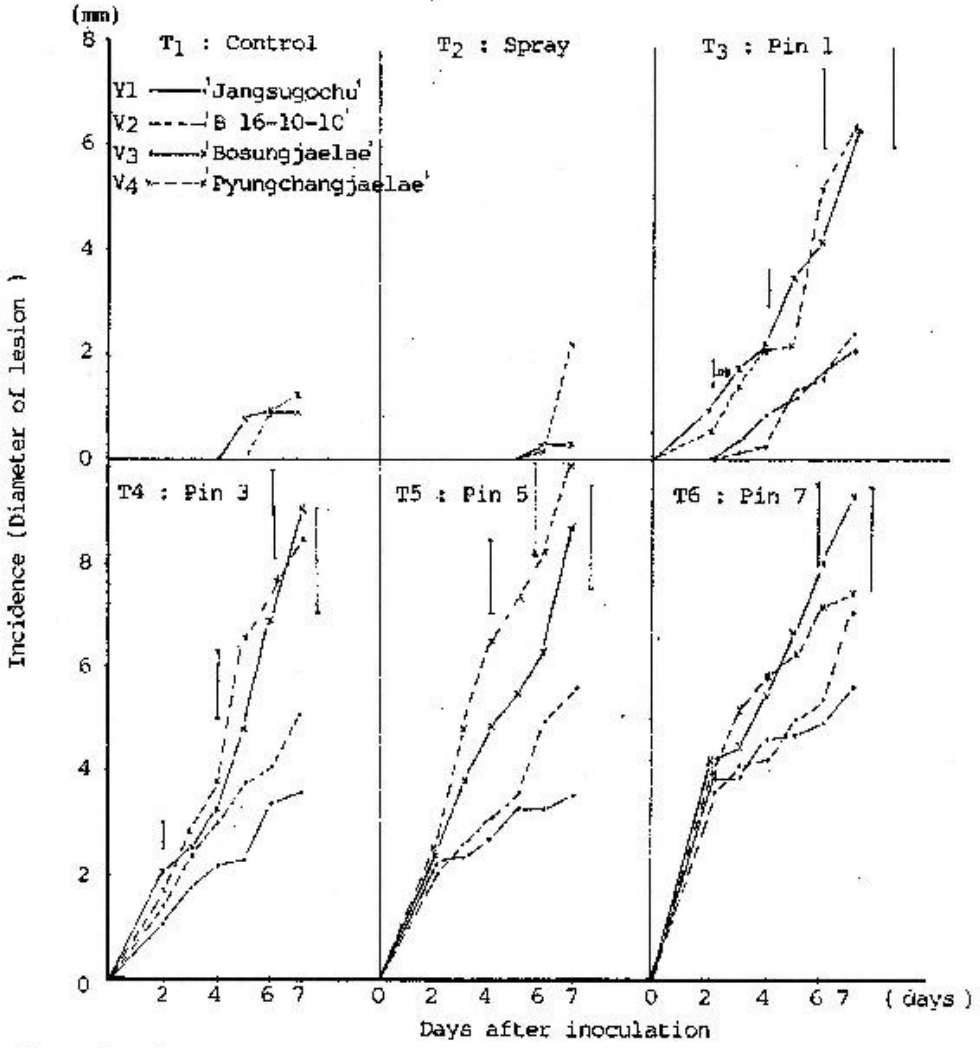

Fig. 2. Varietal response as influenced by several inoculation methods of C. dematium in red pepper.

RESULTS OF AN EXPERIMENT OF SIX YEARS STORAGE OF PEPPER SEEDS

(Capsicum annuuu L..)

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Aim of the work was the study of the effects of storage environment conditions upon pepper (Capsicum annuum L.) seeds ageing.

For this purpose in 1980 twelve storage environments were set up, which differed for the combination of three temperatures and four levels of relative humidity (see Capsicum Newsletter $n^0$1 p.83). The examined conditions were the following:

room temperature	R.H.(%) = 20, 35, 55, 76
I = 25^0C	R.H.(%) = 20, 35, 55, 76
T = 35%	R.H.(%) = 20, 35, 55, 76

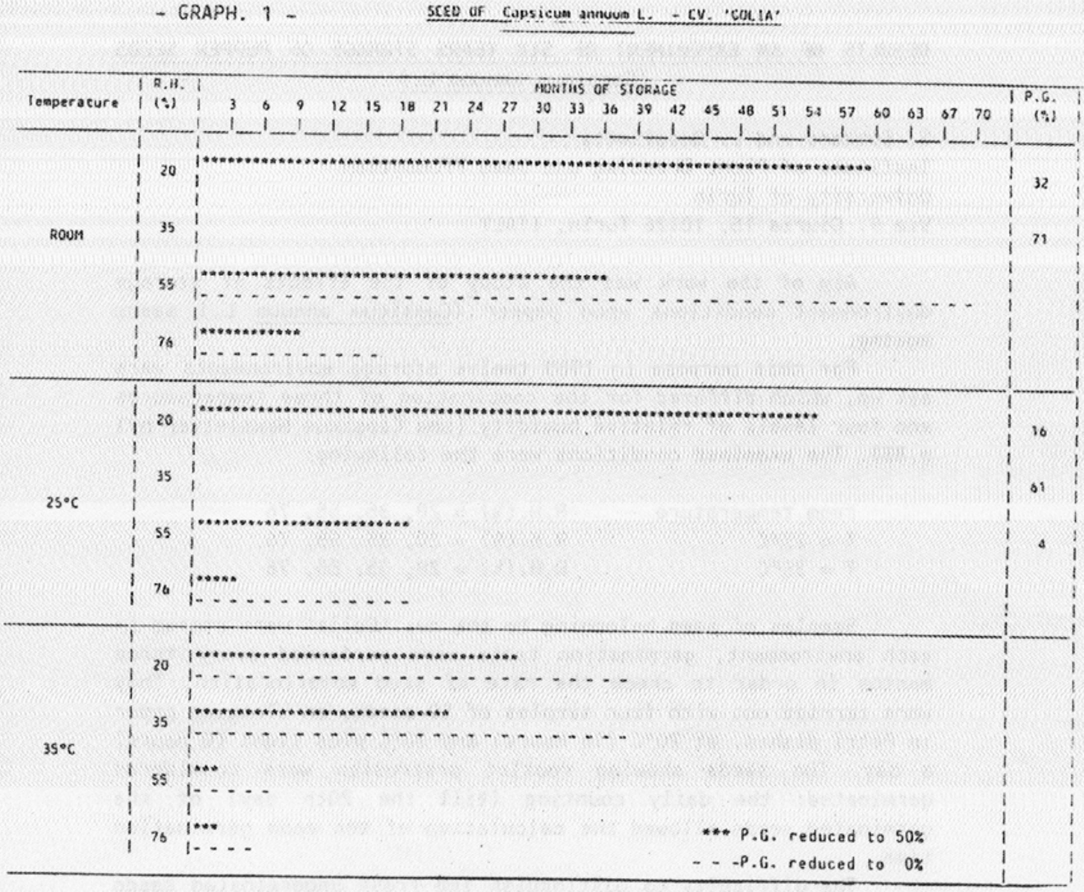
Samples of seed belonging to the cv.'Golia' were stored in each environment, germination tests were performed every three months in order to check the rate of seed deterioration. They were carried out with four samples of 50 seeds, on blotting paper in Petri dishes, at 20% (16 hours) and 30^0C plus light (8 hours) a day. The seeds showing rootlet protrusion were considered germinated; the daily counting (till the 20th day) of the germinated seeds allowed the calculation of the mean germination time.

The difficulty to distinguish the fresh ungerminated seeds from the dead seeds at the end of the trials suggested to apply a biochemical test of viability as TTC.

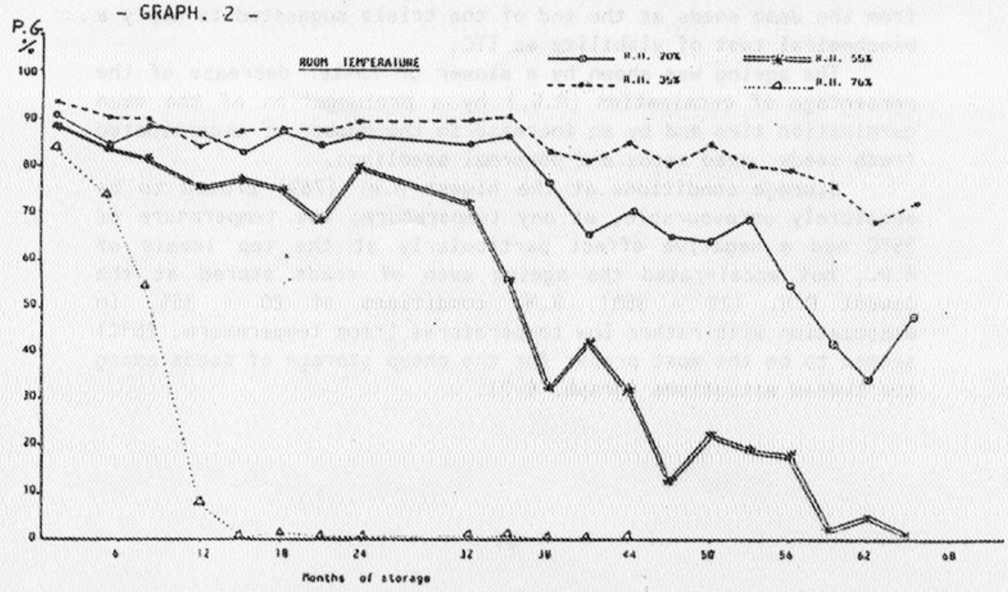
The ageing was shown by a slower or faster decrease of the percentage of germination (P.C.) by a prolungation of the mean germination time and by an increase in the number of ungerminated fresh seeds, dead seeds and abnormal seedlings.

Storage conditions at the highest R.H. (76%) proved to be absolutely unfavourable, at any temperature; the temperature of 35% had a negative effect particularly at the top levels of R.H., but accelerated the ageing even of seeds stored at the lowest R.H. (20 - 35%). R.H. conditions of 20 - 35%, in association with rather low temperatures (room temperature, 25°C) seemed to be the most proper for the cheap storage of seeds among the tested situations (graph. 1-2).

- GRAPH. 1 -



- GRAPH. 2 -



AVRDC ADDS PEPPER AS NEW PRINCIPAL CROP

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AVRDC has added sweet and hot pepper (Capsicum annuum var. annum) to be the sixth principal crop in the Center's intensive crop improvement program. It will join Chinese cabbage, mungbean, soybean, sweet potato and tomato. AVRDC followed an exhaustive selection process which utilized elements of an adaptability study from the 1st Developmental Basket, an international desk study on vegetable status, and an in-house value weighting of potential vegetables before selection of pepper occurred.

Although this search to add new principal vegetables did not begin until 1984, AVRDC already had a wealth of field data from the 1st Development Basket. The Development Basket attempts to evaluate the yield and horticultural characteristics of commercially-available cultivars under tropical conditions for use (1) in AVRDC's nutrition garden program, (2) with international cooperators, and (3) in AVRDC's training program. Of the 15 vegetables originally considered in the 1st Basket, five were identified as most suitable: Chinese mustard, Chinese radish, cauliflower, snap bean and pepper. Extensive cultural data from international field trials in 32 locations have been obtained for these crops.

During 1983-84 a desk study, supplemented by inputs from cooperators in national programs, was conducted on vegetables. The study dealt with environmental and biological constraints, production status, nutritional status and status of national vegetable research programs. Pepper was found to be one of the most commonly grown vegetable crops in developing countries. The specific interest in vegetable research was surveyed in 12 countries, 6 each in Asia and Africa and 2 in the Americas. Pepper was of either production or research interest in 8 of the 12 countries surveyed.

After the decision had been taken to select new principal crops, AVRDC's senior scientific staff value-weighted 15 vegetables (pepper, pai-tsai, cabbage, mustard, amaranth, eggplant, onion, cauliflower, lettuce, pumpkin, okra, cucumber and spinach). Previous studies and surveys had indicated that these crops should be considered as potential new principal crops. They were evaluated for:

- popularity in the tropics;
- nutritional level;
- potential for successful production in the hot, wet lowland tropics;
- potential to increase farmer's income;
- adaptability for inclusion into 'present farming systems; and
- practicality of inclusion into the existing research environment of AVRDC.

Pepper received the highest individual and overall ratings.

Pepper was found to be a popular crop in the tropics. Nutritionally, it contains significant amounts of Vitamins A and C, can be used in fresh and processed form and has generally longer shelf-life with better transportability than most other fruit vegetables like tomato. However, the adaptability of pepper under hot, humid tropical conditions appears to be better than tomato. For example, it appears to be more tolerant to excess soil moisture. From a breeding standpoint, good germplasm collections of pepper are available from many sources, It shares, in large part, similar disease and pest problems as the tomato which AVRDC already has long experience and expertise with. Economically, pepper is also a good choice for greater income generation among the farming sector. It is a crop for large- as well as small-scale production.

AVRDC will, however, have its work cut out. One formidable constraint to the present production of pepper in the hot, wet tropics is its susceptibility to a number of viruses and to bacterial wilt as well as other diseases such as bacterial leaf spot. southern blight, and Phythothora rot. Although hot pepper adapts well to the high temperature of the topics, fruit setting among the weeet bell types is beset by many difficulties.

A V R D C INTERNATIONAL SYMPOBIUM

The First Symposium on integrated management practices for tomato and pepper production in the tropics will be held at AVRDC 22-25 March 1988.

Persons interested in attending are asked to contact AVRDC Virologist Dr. Sylvia Green.

PROGRESS IN EGGPLANT BREEDING, USE OF HAPLOHETHOD.

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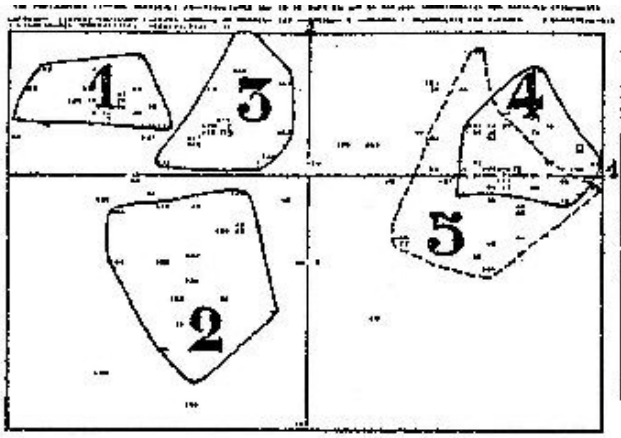
The work reported here shows that the haplomethod technique, when applied to the eggplant, can significantly shorten selection time, and also facilitate screening of new genotypes created by meiotic recombinations.

Having obtained 156 doubled haploid pure lines (DH) using a method already published (Isouard 1979, Dumas de Vaulx 1982), within a year of the parental population plants' anther culture, 20 of these lines upwent a trial in tunnel. A year later, 189 Dli lines underwent a field trial in a comparative study; then 5 Fl hybrids were created, of which at least one of the parent plants was taken from the best Dli lines. Variety trials have been initiated with these hybrids. The field trial of the 189 Dli lines allowed comparisons to be made amongst them and also with several (12) control lines and F^{l} hybrids taken from the parents of the DR lines.
Six replications allowed intra-line and intra-control homogeneity evaluation. Data were collected on 33 variables in the 726 plots =(l89 1-12) X 6 Correspondence Analysis (CA) was carried out on a 761681 matrix obtained after eliminating missing values and coding the variables.
Dynamic Centers classification method was then applied to the CA 7 main factors.

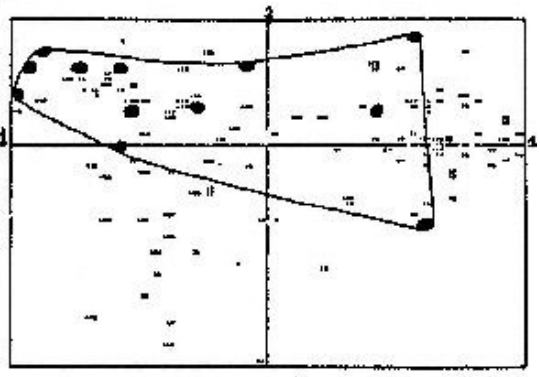
These analyses gave good results in terms of' screening efficiency, given the large number of' genotypes studied.
The results made it possible to select DR lines with high potential for various characteristics (yield, precocity, vigor, fruit color, fruit shape homogeneity).
Well separated groups of DII lines appeared, indicating the most promising hybrid combinations to follow up.
Groups which differed completely from the parental control genotypes were clearly defined.
Dli intra-line homogeneity was found to be excellent compared to that of the genealogic control lines.
Total variability of' the DR lines was checked in comparison with that of the 12 controls. The homology of both groups is clear, however the group of' Dli lines is more widespread since about 59 % of the individuals fall outside the control group.

This work applying an in vitro culture method made it possible to give the breeder: lines at least as homozygous as his genealogic pure lines, and a wide range of 'breedable characteristics (genes) dispatched in many stable combinations. This was achieved in only 3 years, less the half the time normally expected.

ISOUARD G.et all, 1979, Obtention de plantes haploides et diploïdes par culture in vitro danthères dAubergine (Solanum melongena L.). C.R. Acad. Sc. Paris, 288, p987.
DUMAS DE VAULX R., CHAHBONNET D., 1982, Culture in vitro d'anthères d' Aubergine (Solanum melongena L.): stimulation de la production des plantes au moyen de traitements a 35^{0}C associés a de faibles teneurs en substances de croissance. Agronomie 2(18), p983.

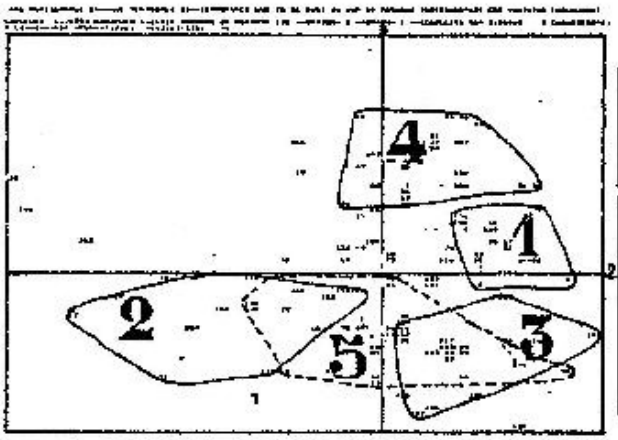


THE FIVE VERY STABLE GROUPS SHOWN BY THE DYNAMIC CENTERS METHOD

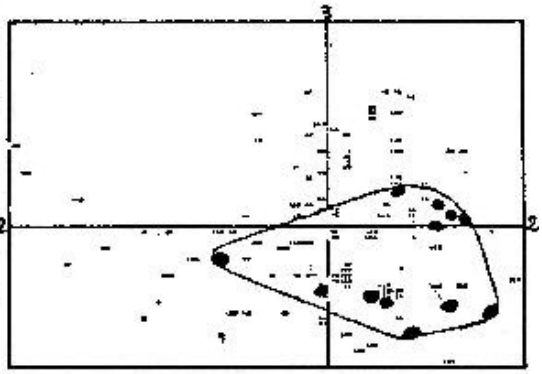


CONTROLS GROUP / ALL DH LINES

PLAN 1-2 OF THE CA, REPRESENTING 45% TOTAL VARIABILITY



THE FIVE VERY STABLE GROUPS SHOWN BY THE DYNAMIC CENTERS METHOD



CONTROLS GROUP / ALL DH LINES

PLAN 2-3 OF THE CA REPRESENTING 16% TOTAL VARIABILITY

	AVERAGE	STD. DEVIATION	MINI	MAXI	UNIT
FRUIT DIAMETER	73	20	10	195	MM
FRUIT LENGTH	165	47	70	530	MM
ANTHOCYAN ON STEM	(QUALITATIVE)				
PLANT HEIGHT	34	8.6	11	60	CM
PLANT DIAMETER	54	8	22	82	CM
YIELD (WEIGHT)	1012	465	0	2500	GRAMS/PLANT
YIELD (NUMBER)	5.4	2.5	0	15	FRUITS/PLANT
PISTILLAR MARK SHAPE	(QUALITATIVE)				
LEAF FRESH WEIGHT	127	44	25	284	GRAM
PETIOLE LENGTH	99	21	0	185	MM

MAIN DESCRIPTIVE CHARACTERS: STATISTICAL PARAMETERS

66

CULTIVAR RESFONSE OF THE EGG PLANT (SOLANUM MELONGENA) AT DIFFERENT PERIODS OF TRANSPLANT.

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The influence of thermic regime and cultivar response of 6 cv of eggplant cultivated in warm (thermostat at 13°C) and cold greenhouses (thermostat at 6°C),with three periods of transplant (5^{th} January, 5^{th} February, 5^{th} March) ,was examined.

The parameters recorded ware: number of days from transplant to beginning of flowaring, setting and harvesting; early and total production; profits from the singles cultures; heating costs in the two greenhouses, in the three periods of transplant.

The eggplant cultivars showing the best chilling resistance, in the cold greenhouse, were ‘Meridiana’ and ‘Milionaire’; these cultivars showed the highest early production considering the average of the three periods of transplant.

The second period of transplant proved more advantageous economically than the first and third periods, for highest productivity and lowest heating costs.

EVALUATION OF EGGPLANT RESISTANCE TO Colietotrichum gloeosporioides

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National Research Center for Vegetable Crops (CNPH/EMBRAPA) Caixa Postal, 07-0218 70.359 Brasilia, D.F., BRAZIL

The evaluation of eggplant reaction to Colletotrichum gloesoporioides has been commonly done through the inoculation of fruits with a conidium suspension. Other methodologies, however, have been employed.

In order to standardize inoculation methodology for our disease resistance program, seven methods of fruit inoculation were evaluated (Table 1), using four C. gioeosporioides isolates, from different hosts in two concentrations (10^6 and 10^4 con/ml). Inoculated fruits were incubated at 26°C in a Percival 1-35 DL chamber.

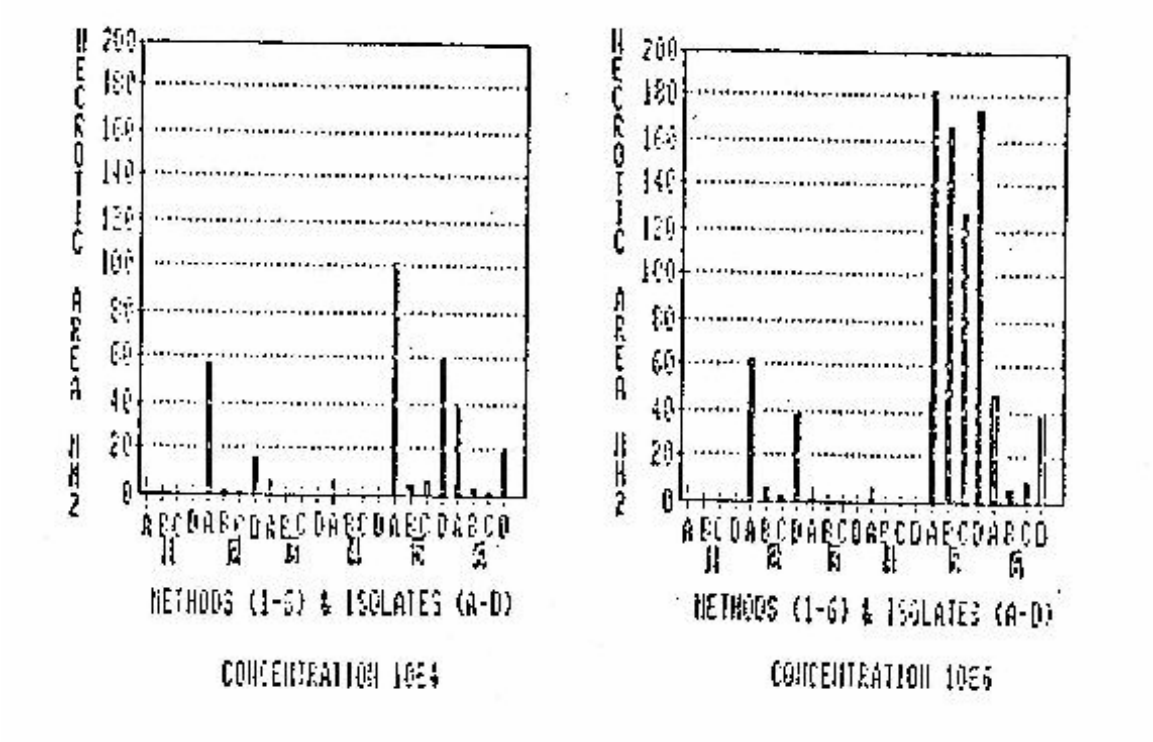
Average necrotic areas, considering lesion length x width, were measured 4 days after fruit inoculation. Results indicated that the most efficient method of inoculation was the sub-injection of 0.1ml of a 10^4-con/ml suspension (Figure 1 and Table 2).

The possibility of detecting resistance in seedlings through the evaluation of necrotic area in the spray-inoculated cotyledons, and its correlation with fruit reaction, is being explored. Preliminary results using cvs. (resistant) and 'Florida Market' (susceptible) strongly suggest the viability of using such a method. Further work is necessary in order to determine the precision of this method in detecting and separating genotypes with intermediate reactions.

Table 1. Inoculation methods on fruits

1. Deposition of 10 u1 on top of horizontally-laid fruits
2. Deposition of 10 u1 with needle wounding
3. Deposition of 10 p1 with carborundum wounding
4. Deposition of 10 p1 on bottom of horizontally-laid fruits
5. Sub-epidermal injection of a 0.1 ml of the conidium suspension
6. Insertion of conidium - infested toothpicks, 2-3 deep
7. Deposition of micelial plugs + PDA in wells made with cork- borers

Figure 1. Lesioned eggplant fruit areas in relation to inoculation methods, isolates and concentrations



Methods (1-6) & Isolates (A-D)
Concentration 1084
Vertical: Necrotic Area NN2

Table 2. Lesioned fruit area (mn9) obtained with inoculation method /=/ 7

	Isolates			
Area	A	B	C	D
	232	37	44	192

EVALUATION OF EGGPLANT VARIETIES FOR RESISTANCE AGAINST LEAFHOPPER AMRASCA BIGUTTULA I3IGUTTULA ISI-UDA.

G.C. Tewari and P.N. Krishna Moorthy
Indian Institute of Horticultural Research, Banqalore-560089.

Leafhopper, Amrasca biguttula biguttula Ishida is a key pest of eggplant. Though the chemical control methods are known, the plant resistance offers a sound and stable control - method without any disturbance to the eco-system. Earlier, Mote (1978, 1982) and Subbaratanam et al, (1983) screened few varieties for their resistance against eggplant leafhopper. In present studies, efforts were made to evaluate some newer eggplant varieties under field conditions for their resistance against leafhopper.

MATERIALS AND METHODS

Sixteen eggplant varieties were transplanted in a randomized block design with individual plot size of 2 rows of 5 m length. Number of leafhopper nymphs per *3* leaves (top, middle, bottom) on 5 plants per plot were recorded at different intervals in three replications. The data were subjected to log transformation.

RESULTS

The results are presented in Table.1. The varieties 'H-4' and 'Pusa Purple Round' were the best on the basis of cumulative population followed by 'Manjari Oota' and 'Black Beauty'. The varieties Shanker Vijay', 'Pusa Purple Long' and 'Mukta Keshi' were found to be most suscaptible. Comparative resistant against leafhopper in eggplant varieties 'H-4' (Mote, 1978; Subbarathnam et el, 1983) aid 'Pusa Purple Round' (Mote, 1978; 1982) has been demonstrated earlier.

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Subbaratnam, G.V; Butani, D.K. and Krishna Murthy Rao, B.H. 1983. Leaf characters of brinjal governing resistance to jassid, Amrasca biguttula biguttul.a Ishida. Indian J. Ent. 45 (2): 171-173.

Table –1

Screening eggplant varieties against
A. biguttala biguttala Ishida.

Variety	Mean No./3 leaves on 5 plantes *				
	40 days	55 days	70 days	85 days	Cumulative leafhopper No.
'Manjari Gota'	1.55	1.77	1.99	2.19	2.53^{b}
'Mukta Keshi'	1.84	1.15	2.41	2.45	2.87^{i}
'ARU-20'	1.73	2.01	2.30	2.32	2.7^{5efg}
'K 202-9'	1.64	2.01	2.35	2.40	2.79^{gh}
'Pusa Purple Round'	1.46	1.76	1.93	2.13	2.48^{a}
'SM 17-4'	1.65	1.98	2.37	2.37	2.78^{fgh}
'H-4'	1.45	1.70	1.88	2.14	2.46^{a}
'Pusa Purple Cluster'	1.74	1.98	2.12	2.31	2.68^{d}
'PBr 129-5'	1.68	1.99	2.33	2.42	2.79^{gh}
'Shankar Vijay'	1.83	2.25	2.44	2.44	2.90^{i}
'Arka Navneet'	1.62	1.84	2.29	2.33	2.71^{de}
'Arka Kusumakar'	1.76	2.02	2.35	2.45	2.82^{h}
'Arka Sheel'	1.68	1.87	2.32	2.35	2.74^{ef}
'Pusa Purple Long'	1.79	2.20	2.44	2.45	2.89^{i}
'Black Beauty'	1.56	1.81	2.00	2.25	2.57^{b}
'Banaras Giant'	1.70	1.88	2.05	2.27	2.62^{c}
SEM	0.05	0.03	0.03	0.02	0.02
CD at 5%	0.15	0.10	0.08	0.06	0.04

* Log (x+2) values.
Treatment means followed by the same alphabet are not statistically different.

GERMINATION TRIALS OF EGGPLANT SEEDS (Solanum melongena L.)

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In 1976 an experiment was planned to evaluate the influence of different factors upon the germination process of eggplant seeds.
Seed samples of three lots produced in 1976, belonging to cultivar 'Black Beauty', 'Violetta di New York' and 'Di Sicilia' were tested: 11 germination trials were carried out at six months' interval from 1977 to 1982; a twelfth was made in 1986. At each trial 9 germination situations were tested; the last one is the one reported in the Official Seed Testing Methods*. Five replications of 100 seeds each were used for each cultivar and for each environment; the number of germinated seeds was counted daily until the 45th day, representing the end of the test. Some parameters were measured, among which percentage of germination (PG), percentage of fresh ungerminated seeds (FUS), percentage of dead seeds (DS), and mean germination time (MGT).
Results and Discussion
The effect of three factors, (cultivar, environment and storage), has been evaluated: the last one has shown the lowest influence on PG and MGT, measured at both 14 and 45 days of germination tests. 'Cultivar' factor has always shown the highest effect as regards PG; on the contrary, as regards MGT, 'environment' factor prevails over 'cultivar' factor at 14 days, but the opposite is true at 45 days. On the whole, the seed samples of the cultivar 'Black Beauty' gave the highest PG and the lowest MGT, followed by 'Violetta di New York' and 'Di Sicilia' respectively. The four diagrams in the following page show the PG of cv 'Black Beauty' seeds in the 12 trials and at the four temperatures tested; the Official Methods (20/3O°C) condition is considered as a control and its values
are marked as single points, while the two curves link values referred to light and dark conditions. Only in the first diagram the values referred to both the14th and the 45th day of each test are reported; in the others there are only the values concerning the 45th day, which substantially confirm those at the 14th day. Lighting has not shown a clear and univocal influence on PG in the 3 cvs (for example, while the cv 'Black Beauty' fundamentally shows a higher PG at 25% in the dark, at the same temperature the other two cvs show a higher PG in the light); on the contrary, lighting shows a marked and univocal effect on MGT for all the 3 cvs here examined: at each condition, in fact, germination almost always occurs faster in the dark than in the light. The Official Methods (20/30%) condition has revealed to be the best one for the cultivar 'Di Sicilia', as regards both PG and MCI; the other two cvs have shown a greater adaptability to environmental conditions.

*Metodi Ufficiali di Analisi delle Sementi-Ministero Agric. e Foreste, Roma 1965.

	Temperature (°C)	Lighting
1)	20	+
2)	20	-
3)	25	+
4)	25	-
5)	30	+
6)	30	-
7)	35	+
8)	35	-
9)	20/30	-/+

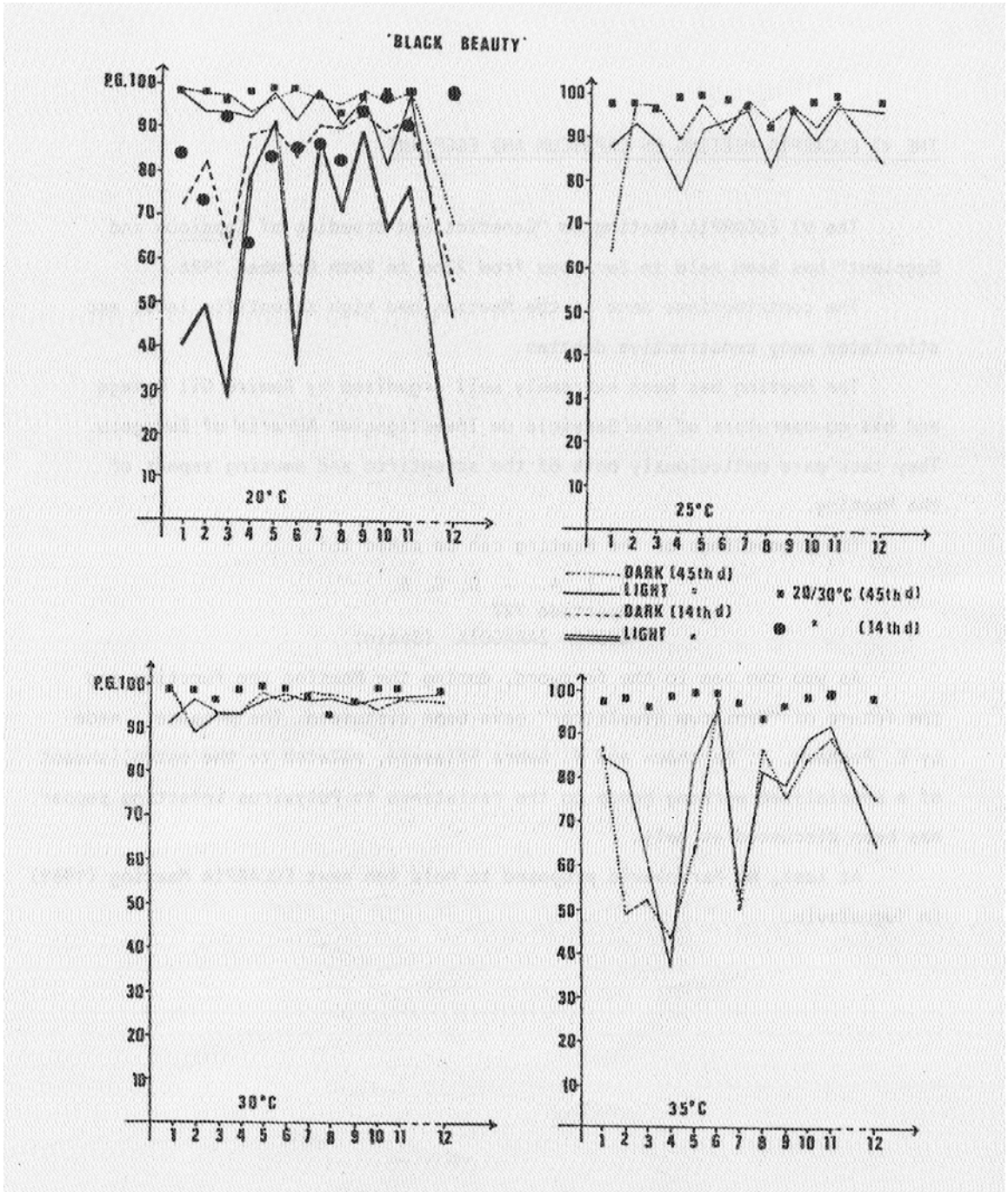

Fig. n. 1 - Percentage of germination (vertical axis) of cv 'Black Beauty' seeds during 12 germination trials (horizontal axis), in 9 environmental situations.

THE 6th EUCARPIA MEETING ON CAPSICUM AND EGGPLANT

The 6th EUCARP1A Meeting on "Genetics and breeding of Capsicum and Eggplant" has been held in Zaragoza from 22nd to 24th October 1986.

The contributions done at the Meeting had high scientific level and stimulated many constructive debates.

The Meeting has been extremely well organized by Ramiro Gil Ortega and his co-operators of the 'Servicio de lnvestigacion Agraria'of Zaragoza. They took care meticulously both of the scientific and amusing aspect of the Meeting.

The proceedings of the Meeting can be asked to:

S. I. A. - D. G. A.
Apartado 727
50080 ZARAGOZA (Spain)

As you can see in the foreword, during the Meeting the function and the future of "Capsicum Newsletter" have been discussed. The proposal, made by E. Pochard, G. Marchoux and K. Gebre Sélassié, related to the establishment of a specialized working group on the resistance to Potyvirus infecting pepper, has been discussed as well.

At last, N. Marinkovic proposed to hold the next EUCARPIA Meeting (1989) in Yugoslavia.

The Participants of the Zaragoza Meeting

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