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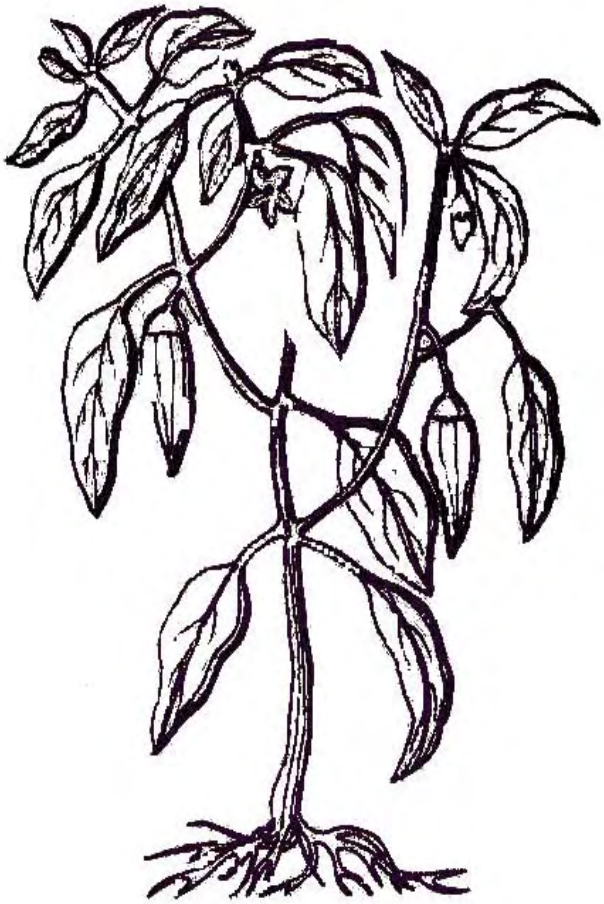

N. 7 **1988**

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Institute of Plant Breeding and Seed Production

Via P. Giuria, 15 - 10126 Turin - Italy

CAPSICUM NEWSLETTER
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P. Belletti, M. 0. Nassi, L. Quagliotti

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FOREWORD

Some interesting changes have been introduced in the 7th edition of "Capsicum Newsletter". As we hope, they will contribute to increase the scientific value and the usefulness of the publication.

The most important innovation is the introduction, at the beginning of the volume, of some invited papers, that give a general and up-to-date view on some aspects of genetics and breeding of pepper and eggplant. In this issue we included four invited papers concerned with a new cross-pollination program for pepper breeding (A. Andrasfalvy and G. Csillery), the classification of tobacco mosaic viruses pathotypes and of Capsicum genotypes resistant (A. Rast), the collection of pepper germplasm (W. Hardy Eshbaugh) and the taxonomy of Solanum genus (M.C. Daunay and R.N. Lester).

We will be grateful to our recipients for any suggestion on the subjects to be considered for the next issues of "Capsicum Newsletter".

Another new survey is that of received articles, in which the references of the most interesting articles on genetics and breeding of pepper and eggplant that we received during 1988 are indicated. In order to make this survey more useful and complete, we ask all the researchers to send us a copy of their articles.

We have not been able to take into account other suggestions, such as the reduction of the size of the volume, the transcription of the phone number of the recipients, the introduction of the tomato among the species considered or the exclusion of the eggplant.

As far as the circulation of "Capsicum Newsletter" is concerned, there are important changes as well. As a first this issue is sent only to Institutes, Research Centers and public and private Bodies. Owing to economic reasons we are no more able to send copies to individual researchers as well. Thanks to kind disponibility of EUCARPIA Secretariat, a service of subscription to the Newsletter has been activated. The subscription rate is of 20 $ for normal subscribers and 100 $ for

supporters. These latter will be mentioned in a proper space of the issue. In order to make the subscription you may send the chosen fee to EUCARPIA Secretariat (P.O. Box 128, 67100 Wageningen, The Netherlands) paying into the Netherlands Bank, current account A.B.N./539128090. Please specify clearly your name and the cause of the payment. The EUCARPIA Secretariat will send us the list of subscribers.

As for the past, none of the contributions has been corrected by the editors. Therefore the authors only are responsible for both scientific content and form of the reports.

At last, many contributions not typed according to the instructions given in the sample sheet have been included in this issue. Starting from the next one, the contributions not in compliance with the instructions will not be published and will be sent back to the authors.

Thank you for your cooperation.

Piero Belletti, Maria Ornella Nassi, Luciana Quagliotti

Turin, 31st March 1989

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LIST OF THE AUTHORS

LIST OF THE CONTRIBUTIONS

Capsicum Newsletter, 7 (1988), 13-19. Invited paper

COMPOSITE CROSS OF PEPPER

"COCROPE"
Research Institute for Vegetable Crops
Station Budapest
H - 1775, Budapest, PF.s. 95
Hungary

Recruiting for a cooperative enterprise in the application of a most potent breeding procedure

The COMPOSITE CROSS (CC) breeding design

INTRODUCTION

The main concern of a breeder of the pioneering type is the utilization of genetic variability represented in the diversity of genetic resources of whatever origin. In "traditional" breeding aimed to release new varieties for the producer as soon as possible, by creating new recombinants and sorting out undesired ones on the basis of defined criteria the risk, of loosing precious preexisting genes cannot be avoided. Moreover, potentially favorable recombinants of a host of individual minor genes with an endless variety of interactions, *which may* be desirable at least as probably as the genes themselves, cannot be developed but a small fraction of them. Overwhelming proofs of hybrid vigor in autogamous plants with scarce evidences of inbreeding depression may indicate the wealth of interactions unexhausted in the existing "pure line" varieties.

In alligators organisms, a nearly panmictic mating system could serve as a substrate for MASS SELECTION, the most potent mechanism of progressive improvement, by imitating the natural pathway of evolution. In predominantly autogamous species the incidence of recombination is restricted to a small fraction of the population, i.e. to the early generation progenies of the relatively rare outcrosses. Even a tedious and carefully elaborate pedigree program (with relatively few biparental crosses) cannot approach the efficacy of (a single) intercrossing of an out breeding population.

To call attention to the CC (or synthetic) initiated by Suneson (published first in 1951) in barley breeding as an "evolutionary" method (1956) is the target of this announcement. The 40 years since then proved the value of the idea in practical barley breeding, convincingly. We wonder, why it was not applied in pepper being predominantly autogamous as well?

ENFORCED ALLOGAMY in an autogamous crop represents a couple of difficulties. We cannot rely an traditional crossing techniques but at a very limited extent. Disturbances in the self pollinating mechanism have to be exploited and/or guarantees have to be found to distinguish outcrosses and selfs with high probability and ease. For both alternatives the Capsicum offers excellent opportunities.

The prerequisits of starting'a CC program in pepper are as good as given. A couple of genic (nuclear) male sterility (ms) genes as well as a profuse choice of seedling marker genes are.on our list free for use to volonteers.

As for the utility of the method? if anybody might doubt it, one may refer to the unfriendly fact of polygenic resistance to very Important pests and diseases, the need of searching for "horizontal" resistance, let alone the hopes attached to directional selection for character expressions never k-known before.
Let LIS initiate a joint venture for the well-founded interest of all of us! Participate in the efforts of the COCROPE, and we shall see the results within ten years about (moreover Successors will praise our memory as that of blessed Harlan's and Suneson's)...

THE PURPOSE
The purpose of COCROPE is summarized in three points:

1. The existing and available gene pool of Capsicum annuum, distributed in the wide range of land races as well as in (semi-)spontaneous populations, is far from being exhausted by the present varieties and hopelessly untouched by the traditional breeding methods. We ought to have some idea about their utility!

2. Seemingly useless phenotypes may hide precious qtnes, which remain unnoticed or undetectable in the given genetic background. We have to put them into different genetical backgrounds!

3. The number of possible combinations of existing, known as well as undiscovered genes and polygenes is well beyond the scope of, vitro physical grip, though potentially interesting. Thus we shall promote the recombination of existing genes the more the ,better!

THE PROCEDURE

ALTERNATIVE I.

1. Collect and build up a gene pool of Capsicum annuum (and related species)

2. Make the first intercrosses (biparental hybrids) preferably in a diallel or half diallel (without reciprocals) system, between as many and as divergent varieties, lines and/or accessions as possible, in order to eliminate extreme phenotypic differences causing uncontrollable biases in the initial gene frequencies just during the first steps of multiplication.

3. Repeat the manual intercrosses in the F1 generation in a similar manner, or reduce the exponentially increasing possible combinations to a reasonable level. In later generations, one can also rely, consciously, on natural cross pollination mechanisms, i.e. insects, in order to keep up with the increasing bulk of the population, thus natural cross pollination (NCP) may be reasonably between 2 to 15 per cent. The larger population is carried on the betteri5.

4. For reasons of economy, management of labor and nursery capacity must be optimalised being limited to a set level. For that reason use just from the very beginning a system which Is based on the "Single Seed Descent" (SSD) principle, i.e. harvest seed from all, or at least from as many plants as possible, separately, WITHOUT SELECTION (let work natural selection!), and let in the next generation represent, EQUALLY, each harvested plant, at least by a single progeny. Therefore, the population of harvested plants should not be mixed LIP until sampled ' for each planting carefully maintaining the initial balance of the parental

specimens of the previous generation. The initial CC may designated as "General" or GCC.

5. The GCC populations are duplicated and/or multiplied parallelly in order to distribute them to different localities and/or growing Conditions all over the (World) ecological range of pepper growing. After the due time, environmental conditions will forge in each case a different evolutionary adaptation coincident with our purpose. Those, after some cycles of reproduction, one should designate "Regional Composite' Crosses" with an identity mart', (RCC.id).

6. Similarly., the original GCC (or RCC) can be directed purposefully towards more special aims, e.g. types of utilization, Consumption preferences, resistance to major diseases and pests, etc. Those are the "Special Composites" (SCC.id) which may have at the same time a "Regional" allocation (SRCC.id.id, e.g. SRCC.E.H CC for earliness in Hungary). Two moments have to be taken apart, however:

- Pressure of local or artificial infection lets work Natural selection,
- Choice of preferred phenotypes for practical purposes, e.g. lack of Capsaicin for special markets, rather ignores natural selection for the preferred trait.

7. After some generations of "bull," handling, individual plant selections, Subsequently, lines can be recovered for practical breeding purposes continuing the traditional routine.

ALTERNATIVE II.

The alternative means the utilization of genic male sterile maternal plants (SM) and marked maternal plants (MM) singly or in combination in order to facilitate intercrossing of individual SM plants and/or to identify the hybrids or outcrosses in the progeny of the harvested MM plants. Though it means a drastically bias in the initial gene frequencies, but saves considerable labor, especially if one can rely on insect pollination.

1. For that reason, male sterile and marked maternal parents (SM and MM) should be crossed to each item of the original assortment, (or preferably, to the first F1 combinations of the diallel like system).

2. The initial F1 generation of SM and MM parents being heterozygous for the respective (ms or marker) genes, will set fruit freely. In the subsequent F2 progeny, however, Mendel Ian segregation ensues. Thus, fruit set on SM plants is expected to be from less abundant than normal to very scarce, depending on insect (bee) population as well as on synchronous anthesis of SM and normal phenotypes. Maximal (100 per cent) ALLOGAMY, i.e. HYBRIDITY of the progeny is achieved by harvesting the seed from SM or MM plants only. For making up for the reduced incidence of SM and/or MM plants, initially, an increased population should be raised. Later, as always heterozygotes are selected, their ratio may finally at 50 per cent (further details are given later).

-Progenies of SM plants cannot be but outcrosses.

-The incidence of unmarked, i.e. "wild type" plants in the progenies produced on MM plants is a measure of ALLOGAMY (and that would be useful information in characterizing genotypes and

growing sites). If marked seedlings are eliminated having maintained only the "wild" (unmarked) phenotypes, the population will be panmictic in the proper sense. Ratios Of outcrosses are easily determined by telling marked plantlets (germs or transplants) from unmarked ones in Petri dishes or in trays. Allowance must be given to the heterozygosity or gene frequency of the marker genes in the pollinator population.

3. The rest of the program is essentially the same as in ALTERNATIVE I, except', ms and/or marker genes may be maintained, fixed or eliminated as simple Mendelian recessives from the isolated lines by selection in two steps, i.e. checking segregation of the "plant to row" families (at least 20 plants each).

ALTERNATIVE I + 11.

This is the most recommended one aimed to utilize advantages of the previous ones. Essentially, one should start with ALTERNATIVE 1, including SM and/or MM lines into the assortment of the "diallele" as maternal parents, and for reasons of safety, repeat hand pollination once more on the-SM and/or MM segregants of the F2 generation. For convenience, all F1 families and F2 families of SM/MM parents should save their identity in order to combine them systematically. More exactly, segregating SM and/or MM plants of the respective F2 families should be combined in a "diallela" with the initial assortment (or even better with their F1 progenies), save SM and MM lines (and combinations). Further on, as the bulk of work grows to intolerable dimensions, one may switch to ALTERNATIVE II. In strictly autogamous species (e.g. some pulses) the use Of pollen mixture and hand pollination is suggested. In pepper one can easily renounce of any tedious effort of that kind excepted if insect free conditions or special preferences in gene transfer are to be observed.

GENERAL REMARKS FOR THE VENTURING BREEDER

MALE STERILE MATERNAL (SM) PLANTS:

For the sake of profuse intercrossing of SM and normal (pollinator) plants, early fruit sets of the latter ones should be repeatedly thinned or the early type plants should be pruned in order to prevent the development of useless sinks on the weak plants, and to keep a profuse growth and flowering throughout the season. Delay of fruit set (very common in SM plants) stimulates growth (SM plants become usually very tall), branching and prolonged flower production favorable for the purpose of COCROPE. Otherwise, early fruiting phenotypes will suffer disadvantage as pollinators, and we run the risk, to loose precious genes of earliness. Important role is attributed to the bee population visiting pepper, preferably in the second part of the summer when a heavy fruit set usually stops flowering of most cultivars.

At harvest, ripe (or nearly so) fruits should be picked from each plant separately. As far as ms genes are not linked with seedling markers in coupling phase, the identity of SM plants should be assessed in the field (or even better in the nursery, thus SM plants may be planted in the field according to a purposeful pattern) during the flowering season (as early as

possible), mark SM plants with a label which endures until harvest is actual. Later, the decision may become ambiguous, though a heavy fruit set at the first ramification may indicate rather normal pollen fertility. Sterile first ramifications followed by almost normal set of fruit during' the late season may be a safe indication of bee activity on SM plants.

MARKED MATERNAL (MM) PLANTS:

The marked phenotypes of homozyg6us MM plants are easily recognized either by looking even to the germ, later to the hypocotyl, stem, and most clearly, to the anthers of young flowers, as being devoid of purple (anthocyanin) colour, or with other genes causing obvious changes in leaf form and colour. However, the policy of utilizing markers is more sophisticated. One should harvest seed for the purpose Of carrying on the CC from marked MM plants only, but hybridity is guaranteed in "wild" (purple or unmarked) phenotypes of their progeny. Those are heterozygotes and serve as precious pollinators for the next generation, whereas marked progenies in the backcross population are also produced at a ratio of 1:1. As they are not distinct from their selfed half sibs expected to be abundantly produced by autogamy, the population of "wild" phenotypes will easily decline to a minority as normal alleles of the markers are transferred by a fraction of the male gametes only. In order to avoid the risk, of picking out S2, S3, etc. (selfed generation) progenies by chance for the next year's CC, we may harvest a (sufficiently large) population of marked (e.g. purple stem) plants, also individually, just for the purpose of using their segregant MM progenies as maternal parents in the next generation. Thus,, the seed of the next generation must be harvested alternatively, MM plants furnish the Out crossed progeny (recognized by their "wild" phenotype), whereas the "wild type" plants of the same population produce MM segregants as being either outcrosses or first generation selfs (SI), which remain undecided. The ratio of MM and "wild" plants can be decided before each planting$ freely, but priority must be given to the "wild" phenotypes because allogamy is expected to be at a lower rate, as mentioned. Moreover, the number of MM plants to be harvested is limited by reasons of economy, and MM plants as a source of pollen are undesired anyway. The planting design, however, must favor cross pollination between the two phenotypic groups, though allowance may be given to improve orientation and to save costs.

MARKED & MALE STERILE MATERNAL (MSM) PLANTS:

If both SM and MM lines are incorporated into the same CC, recombinants, i.e. MSM, will arise soon. The policy recommended is essentially the same as in the pure SM Version, although an even more sophisticated, compound system of pedigree could be developed (there should be left plenty of space for creative brains). MM segregation can be observed too as in the MM version, or ignored partially or completely. The Population may be fixed for green stem (MM), and MSM will be an efficacious combination for starting new CC-es or F1 seed production. Similarly, SM can be dropped in favor of MM or both may be eradicated at any time if necessary.

FURTHER TRICKS TO BE CONSIDERED:

Fractionate harvest may used as a tool of selecting for earliness, e.g. as building up a SCC.E variant (and may facilitate experimental approach of seasonal effects on the rate of allogamy within the same plants).

For the sake of efficiency either of the original GCC or RCC-e5 or SCC-es etc. a coordinate policy of sufficient tonstancy, on the one hand, and a regular communication as well as mutual exchange of seed between the participants is highly recommended. After 2 or generations Substantial and very tendentious changes may ensue in F-.CC-es which may of prime interest for all Of us. Regional distribution of selection objectives in RSCC-es, e.g. special resistances, qualities, phenological performance, etc. may offer a very efficient structure of cooperation.

THE OFFER OF THE INITIATORS:

STARTING MATERIAL

A nucleus Of the GCC is already under preparation. The first intercrosses have been grown in 19B-2 and 19e4, incorporating the ms-509 gene of Pochard, and later alternatively the ms-3 of Dastealoff. In searching for horizontal type of resistance to CMV as many as 7 and in Addition two more primitive accessions received from J. Singh were intercrossed. As marker gene, first One causing lack of anthocyanin (al) was used, but yellow leaves (frutescens) are now preferred, being more conspicuous. The integration of other accessions to the system is in progress. As far, it is rather a SCC, but it will be extended. Any contribution will be invited and considered as an act of cooperation with all its "legal" consequences.

DOCUMENTATION:

It is planned to list with anxious care all accessions of the assortment used in the initial intercross as well as all Additional contributions. A short description of the growing site in each season as well as any data of the Population, number of plants, planting design, density, ratio of the phenotypes observed, selection, causalities, number of plants harvested, yield and apparent diseases, if observed, etc. Should be registered, and attached to any seed sample to be distributed as the object of the COCROPE program.

	SM system			MM system		
1	S		W	M		W
2		H	W		N	W
3	S	H	W	M	N	W
4	S	H	W	M	N	W
5	S	H	W	M	N	W

The recommened mating system contains the relevant steps only. The rest of genotypes and possible matng relations are discarded or maintained optionally. Each sign means a population of plants. This sketch is not a planting design. The compound SM & MM system is not shown. The planting design ought to favour corss pollination, between the indicated genotypes, but facilitate orientation in the field.

6. etc. generations continued unvariably excepte if single plant selections and breeding lines are recovered selfing

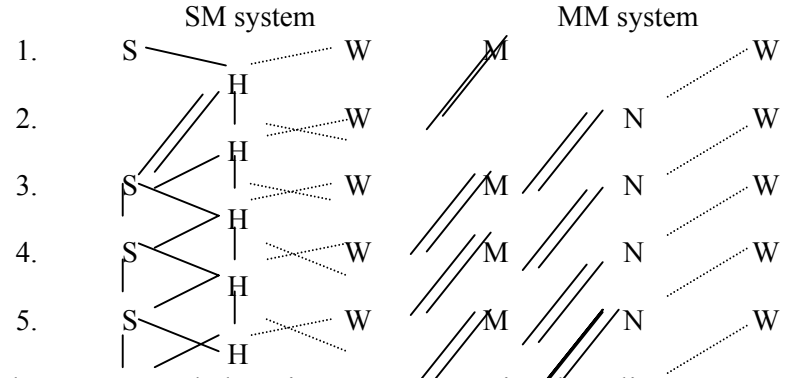
selfing probable

female transfer

male transfer

optional or probable male transfer

S: male sterile plant population
M: marked plant population
W: "wild type" (unmarked) population
H: heterozygotes for male sterility
N: heterozygotes for the marker gene



The recommended mating system contains the reliant steps only. The rest of genotypes and possible mating relations are discard or maintained optionally. Each sign means a population of plants. This sketch is not a planting design. The compound SM & MM system is not shown. The planting design ought to favour cross-pollination, between the indicated genotypes, but facilitate orientation in the field.

6. etc. generations continued unvariably except if single plant selections and breeding lines are recovered

selfing

selfing probable

male transfer

S: male sterile plant production
M: marked plant population
W: “wild type” (unmarked) population
H: heterozygotes for male sterility
N: heterozygotes for the marker gene

Capsicum Newsletter, 7 (1988), 20-23. Invited paper

PEPPER TOBAMOVIRUSES AND PATHOTYPES USED IN RESISTANCE BREEDING

A.Th.B. Rast Research Institute for Plant Protection (IPO), Wageningen, c/o Glasshouse Crops Research Station, P.O. Box 8, 2670 AA Naaldwijk, The Netherlands.

In recent years some of the tobamoviruses, isolated from pepper, were recognized as distinct viruses, while others were found identical or related to tobamoviruses previously isolated from other host plants. Such a classification is based on studies of host range, serological relationships and biochemical properties. As the names given to or proposed for the tobamoviruses do not necessarily refer to pepper they may not be easily adopted by breeders for resistance in this crop. The breeders have meanwhile generally accepted a classification system, based solely on virus-host interactions, in which the pathogenicity of the tobamoviruses is expressed in Arabic numerals relating to the L-gene(s) for resistance overcome in the Capsicum hosts (Table 1). The different interests taken by virologists and breeders in classification of tobamoviruses may therefore result in an ever increasing confusion. In an attempt to promote a better understanding the correct names of pepper tobamoviruses are provisionally compiled together with representative strains or isolates and an indication of the pepper pathotype(s) involved (Table 2). It is furthermore suggested that virologists, whenever using a Capsicum host as a test plant, should be asked to indicate its L-resistance genotype. For their part, breeders should have the tobamoviruses used properly identified according to virological methods and use the correct names in communicating their results.

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Table 1. Pathotype-genotype interaction of tobamoviruses in Capsicum hosts,
(+ = susceptible, resistant)

Host	Genotype	Pathotype			
		P 0	P 1	P 1.2	P 1.2-3.
C. annuum 'Early California Wonder'	L+L+	+	+	+	+
C. annuum 'Bruinsma Wonder'	L [1] L [1]	-	+	+	+
C. frutescens 'Tabasco'	L 2 L [2]	-	-	+	+
C. chinense P.I. 159236	L [3] L [3]	-	-	-	+
C. chacoense P.I. 260429	L [4] L [4]	-	-	-	-

1 Adapted from Boukema et al., 1980.

Table 2. List of tobamoviruses and corresponding pepper pathotypes

Tobamovirus	Strain/isolate	Pathotype	Reference no.
Tobacco mosaic virus (TMV)	type or common strain, vulgare strain, Ul	P 0	11, 17
Tomato mosaic virus (ToMV)	dahlmense strain, Y-TAHV	P 0	5, 6
Bell pepper mottle virus (BePMV)	unusual pepper strain, FO,.eggplant strain Al	P 0	3, 12, 16
Tobacco mild green mosaic virus (TMGMV)	para-tobacco mosaic virus, T2MV, U2, South Carolina mild mottling strain, G-TAMV	P 0 or P 1	6, 7, 11, 14
Unnamed	P 11	P 1	12
Tomato mosaic virus (ToMV)	pepper strain Ob	P I or P 1.2	2
Pepper mild mottle virus (PMMV)	Samsun latent strain, SL-TMV, P 8, P 14, Capsicum mosaic virus	P 1.2 or P 1.2.3.	4, 7, 9, 10, 12, 15

Capsicum Newsletter, 7 (1988), 24-26. Invited paper

CAPSICUM GERMPLASM COLLECTING TRIP - BOLIVIA 1987

W. Hardy Eshbaugh, Department of Botany, Miami University, Oxford, OH 45056. U.S.A.

The genus Capsicum is well represented in Bolivia. The wild taxa Capsicum baccatum var. baccatum, C. cardenasii, C. chacoense, C.eximium and several varieties including C. chacoense var. tomentosum and C. eximium var. tomentosum are widely distributed in the central and southern portions of the country. All of the domesticated species have been reported and collected from Bolivia. It has even been suggested that Bolivia is the nuclear center of the genus and the place of origin of the two domesticated taxa C. baccatum var. pendulum and C. pubescens (McLeod et al., 1982; Eshbaugh et al., 1983). Previous collections of Capsicum germplasm have been made in Bolivia (Eshbaugh, 1980) .

As an outgrowth of the IBPGR meeting in Turialba, Costa Rica in 1980 and the published recommendations in the IBPGR report on "The genetic resources of Capsicum" (1983), a more systematic approach to collect and conserve pepper germplasm has been initiated. This led to earlier collections in Brazil and most recently the collecting trip reported here for Bolivia.

A Capsicum germplasm trip was organized.and subsequently made from 28 March to 11 April 1987. The participants included Dr. Miguel Holle, CIAT, Cali, Colombia; Ing. Mario Crespo M., Centro Fitotechnico, Pairumani, Cochabamba, Bolivia; Ing. Desiderio Flores S. and Sr. Benjamin Rojas, IBTA, La Paz, Bolivia, and the author. The original plan for the collecting trip envisioned covering an area from Cochabamba to Santa Cruz and south to Tarija. However, time and logistics made such an endeavor impossible. Therefore, the collecting area encompassed roughly the region from Cochabamba east to Santa Cruz, south to Camiri, west to Sucre, and northwest to Cochabamba. The area of the Luribay Valley, Dept. La Paz, was also collected. One hundred forty-six accessions were collected but some of these accessions included many individuals comprising large populations (Table 1).

Wild material of C. baccatum var. baccatum, C. chacoense, C. cardenasii, and C. eximium was readily available throughout the collecting region. Unfortunately, the impact of climatological conditions was not the same everywhere. Thus, an unusually dry season in the region from Sucre to Aiquile meant that C. chacoense and C. eximium were scarce in the area. In fact most plants possessed few mature fruits in this location. The lack of germplasm collections is not reflective of the abundance of Capsicum in the area. Another difficulty in collecting samples results from differential fruit maturation from one location to another.

One taxon, C. eximium var. tomentosum, had previously only been collected a few times (Eshbaugh and Smith, 1971). The five

accessions (E1943 A-E) of this taxon provide a meaningful population sample for analysis. The same can be said for C. cardenasii which was previously known primarily from markeF_ collections and one population sample. The'four populations of t. cardenasii (E2038 A-S, E2042 A-K, E2044 A-M, and E2046 A-N) should give us a better idea of variation in this species after analysis. Another especially interesting collection of C. baccatum var. baccatum and C. baccatum ~ar. pendulu (E1962 A-J) represents pure wild forms, a domesticated individual, and various intermediates. The analysis of this population should yield interesting data on the relationships of individuals in this species complex.

Some fascinating and provocative questions can be raised regarding the conservation of Capsicum germplasm in Bolivia It is apparent that none of the wild species is in danger of extinction in Bolivia at this time. Nonetheless, it is also obvious that only a small portion of the Bolivian wild germplasm has been sampled and collected to be stored in gene banks for posbible use in plant breeding. Surely, there are genes in these wild taxa that would be useful in breeding for disease resistance, increased productivity, taste, etc. Another interesting observation is the fact that all four wild taxa are regularly collected and sold in the market place. In some areas the collecting is intensive enough to have led to a commercial operation. Both C. chacoense and C. eximium are bottled and sold in Sucre and Tarija. Much needs to be learned about the harvesting process of wild Capsicum in Bolivia. Are we witnesses to the domestication process of these two taxa? Certainly, one could argue that these taxa are semi-domesticated. Capsicu cardenasii was first described from market collections. Although we did not see evidence of much hybridization between taxa it is known that C. pubescens, C. eximium, and C. cardenasii, hybridize under experimental conditions. Hybrids have also been found in nature (Eshbaugh 1979, 1982). Capsicum baccatum develops extensive hybrid complexes between the wild and domesticated forms where they come in contact with each other. Another question that needs to be addressed is an understanding of the breeding systems and strategies of the wild taxa. For example, Capsicum cardenasii, a self-incompatible species, has undergone a dramatic shift in floral morphology, from rotate for the genus to a campanulate corolla with an accompanying shift to selfincompatibility. Nothing is known of the pollination vectors or breeding system of this species. Little is known about Capsicum in Amazonian Bolivia. It is suspected that several previously undescribed taxa exist in the western region neighboring Peru. This expectation is based upon several collections made by Paul G. Smith in 1959 that have never been described because of insufficient material.

Germplasm collections are deposited at Miami University and Pairumani. Cited collection numbers are those of the author from whom a complete list may be obtained.

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Capsicum Newsletter, 7 (1988), 27-28.

GESITSPLASH RI-BSOURCRIS OF PAPRIKA EFFECT INDIA (KATRAIN)

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The work on paprika improvement has been taken up at this station t;o meet the potential market of paprika in Indi!) and abroad by establishing superior genotypes /hybrids for commercial cultivation. The worlk has been initiated following action plan of IBFGR and with the intention to safeguard and make available the genetic variability of Capsicum genotypes for crop improvement.

The horticultural classification of the following (table) germplasm is based as has been reported by Smith et al. (1987). These collections bavebeen documented as per standard IEPGR descriptor list. A number of collection: which has been duplicated and the seeds of 74 genotypes will be sent to NIPGR hbw Delhi India, one of the genebankst as has been designted by IBPGR, Rome. A little quantity of seed can b- made available if required for paprika crop improvement by requesting through NIPGR, New Delhi.

Table - Horticultural classification of available paprika germplasm

1.Fruit lqrge smooth	EC.12202	blocky blunt
thick fleshed.	EC 19043	or conic al.
A.Dell group-Fruit	EC. 119051	Turns red at
large, 7.5-1 2.5 cm	EC. 119058	matutiry, mostly
long, blocky, blunt	EC. 14 3567	non-pungent
or rectanyular.	EC. 14 3570	Russian Yellow
color green when	FC-157029	AC- 216
immature turning ied	EC.160O93	AC-217
or orange yellow at	EC.174852	Kt-Pl-l 2
maturity. Mostly yellow	EC. 240610	Kt-P1-16
pungent.	B. Pimento group	EC.109050
‘California Wonder’	Fruits heart shaped	EC. 129392
'Yolo Wonder’	3.7-12 cm. long,	E C. 1293931
'Arka Gaurav’	smooth thick walled	EC 157030
‘Arka Mohini’	mos tly non-pungent	EC. 165 8 34
‘Early Bounty’	EC. 93056	EC.174857
‘Suttons Gem Giant'	Kt-PL-13	EC.202467
‘Bharat’	EC.203586	
‘Sweet Bullnose’		EC.2023581
HC-201	2.Fruits yellow when	EC.203582
HC- 202	immature.	EC.203583
Kt-2	A. waxy conical group	EC.203584
K t- PL- 5	Fruits large 7,5-	EC.203585
K t-PL- 6	12.5 cm, long,	EC.203587

EC.2023588
EC.2023589
EC.2023590
B. Long waxy group fruit 8.5-17.5 cm long, poined or blunt, thick walled both pungent and non-pungent, turns red at maturity.
EC.114366
EC.157031
EC.202469
EC. 203592
EC.203593
EC. 203594
EC.203595
EC.203597
EC.203598
EC.203599
EC.203600
3. Fruit broad, smooth thin walled.
A.Aucho group – Furuits 8-15 cm long, heart shaped, pointed, thin walled, fruits with sweet mild and pungent forms, Green when immature, turning crimson red at maturity.
AC-215
AC-218
Kt-1
KCP-1
CKP-2
Kt-PL-3
Kt-PL-7
Kt-PL-8
Kt-PL-9
Kt-PL-10
Sel-4
Vinedale
EC.109054
EC.119049
EC.114360
EC.114362
EC.129391
EC.165831
EC.174816
EC. 17467
EC.202468
Pt-19-1-2

4. Fruits long slender
A. Anaheim chilli Group-Fruits medium To dark green, Smooth, 12-20 cm long, Tapering to pointed Tip flesh medium Thick, sweet mild And pungent forms. Turns red at Maturity.
'Sweet Banana'
'Cubennele'
'Harris Early Giant'
AC-219
N-16
Kt-PL-4
Kt-PL-14
Kt-PL-15
N-106
Pt-19-3
Ec.109048
EC.119048
EC.165832
EC. 173372
EC. 173374
EC. 174854
EC. 174862
B. Long thin cayanne Group. Fruits long slender, medium to dark green, 9.5-25 cm, characteristically wrinkled or irregular in shape thin walled, mostly pungent, mature fruits mostly red with a few orange yellow.
NP-46-A
'Hot Portugal'
'Perennial'
'Cluster'
'Indesian Sel'
'Pach had Yellow'
'Bunchy Orange'
'Kalyanpur No. 1'
1-65
LCA-206
LCA-235
Kt-PC-11
LC-5
LC-8

EC. 222247
5. Fruits elongated to 8.5 cm long, green when immature.
A. Serrano group Fruits slender, Cylindrical often Slightly const-Ricted near Middle, highly Pungent, turns Red.

Serrano

B. Small hot group Fruits slender, Medium to thin Walled, less Than 7.5 cm, Highly pungent, Immature fruits Green black or Dark purple, Turning red at Maturity.
Plant C-1
Local chilli
'Gauhati Black'
CA-586
LC-4
LC-6
EC.174858
6. Fruits small, globular to oblate thick flesh.
A. Cherry group. Cherry shaped Frutis green Turning red Pungent.
EC.203603
B. Tomato shaped Thick fleshed Waxy or green Fruits, smooth To corrugulated, Red at maturity Sweet or moderately Pungent.
Sel-2
EC.203591
EC.203602

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Capsicum Newsletter, 7 (1988), 29.

MICROSPOROGENESIS IN POLLEN STERILE CAPSICUM ANNUUM LINN.

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During the ontogenic development of male gametophyte in one such case of Capsicum annuum, spontaneous disturbances offered a possibility of closer study of th e interesting anomalies occurring during meiosis. These irregularities are assumed to be due to the genotypic imbalance resulting from the inbreeding that has accompanied cultivation.

Micro-preparations from the anthers of sterile plants exhibited an expression of the desynchronisation in the meiosis of pollen mother cells. The hetero-typical meiosis resembled with the fertile analogue, being characterised by synizesis. Further, during the bomeo-,typical meiotic development, the degeneration of tapetum, continued along with the abortion of the sporogenous tissue.

Discoveries of male sterility gives the evidence that product(s) of determinants occur through the tapetum (Vasil, 1967). Similar results concerning the development of the tapetal layer(s) in the course of pollen development and its share in the origin of self incompatibility in Capsicum annuum was observed in the present investigations. Moreover, tht abnormal functioning of the poly-nuclear tapetal layer together with the non-viable deformed micro-spores formed a substance, which got expressively stained with the plasmic pigments inside the cavity of the anther sac. Observations exhibit, that pollen sterility in hot pepper seems to be conditioned by the nuclear genes which shape the expression of the character in the interaction with plasmic hereditary determinants inter-linked with environmental modifiers.

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Capsicum Newsletter, 7 (1988), 30-31.

VIABILITY OF. SWEET PEPPER POLLEN STORED AT CRYOGENIC TEMPERATURES

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When producing hybrid seed of Czechoslovak sweet pepper cultivar Dora F our attention was paid to a possible exploitation of pollen cryopreservation. Reliable method of central cryopreservation of male CW-line pollen and its following distribution to propagating enterprises could eliminate unfavourable influence of some factors affecting hybrid seed production as well as could also be an economic contribution.

To determine pollen germination the liquid medium supplemented with sucrose (8 %) and 30 mg.1- H BO 3 has proved itself best. Pollen viability was identified using modified flu8rescent technique by Peterson, Taber (1987). Functional capacity of the pollen was tested carrying out control pollination under normal growing conditions.

Germination of CW-line pollen stored at -50 0 C, -20 0 C and 4 a C (Graph 1) was recorded at time intervals. 0 Germination of fresh pollen was observed as the control. CW-pollen stored at 4 C was found to keep its germination for 16 days, then intense decline occurred. There was no gtatisticglly significant difference in germination of CW-pollen stored at -50 and -20 C. Germination and full functional capacity (tested by control pollination) was kept approximately at the same level for 66 days followed by gradual decline, nevertheless, the pollen even germinated after 120 days. Initial increase in germination of pollen stored may be due to a slight increase in pollen quality owing to gradual drying-up of pollen under low air humidity conditions.

The viability of fresh CW-pollen was ranging from 19 % to 59 % in dependence on conditions under which the pollen originated.

Table I summarizes Nalues representing the viability of CW-pollen stored in liquid nitrogen (-196 C) and results of control pollination. During first 17 days of storage the pollen viability declined (by about 50 %), however, then it was kept at nearly constant level (Graph 2) over the period up to 82 days (maybe longer), but even after this period CW-line pollen appeared to be of full functional capacity.

Initial intense decrease of viability of pollen grains can be caused by freezing method and or pollen treatment before the freezing. Therefore, our further work is to be aimed at reduction in moisture content owing to pollen predrying-up to eliminate initial decrease in numbers of vigorous pollen grains.

PETERSON R. H., TABER H. G.) 1987, Technique for vital stainino of tomato pollen with fluorescein diacetat, Hort. Sci, 22, 953.

Graph I Dependence f germination in pollen (stored at various temperatures) on storage period

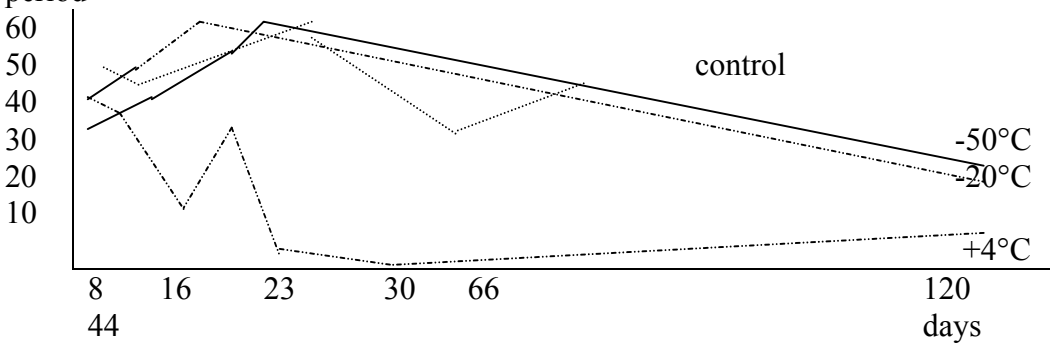
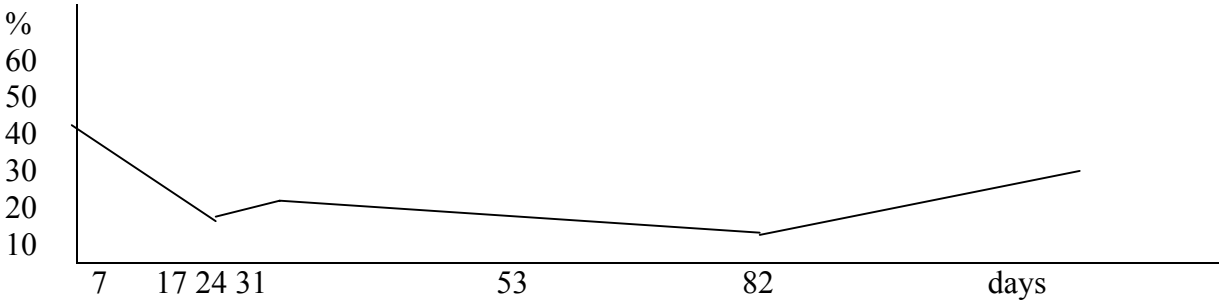


Table 1
Decline of viability of CW-line pollen stored in LN2 (-1960C) Results of control pollination

Storage period (days)	Pollen viability (%)' before storage	after storage	Relative decline of viability (%)'	Number of flowers pollinated	Number of fruits obtained
0	51,36	-	-	25	22
7	59,00	40,99	30,51	5	5
17	45,11	23,16	48,66	5	5
24	52,51	23,13	55,95	5	5
31	45,11	22,38	50,36	-	-
53	53,22	20,99	61,87	5	4
82	53,22	25,33	52,40	5	5

Graph 2
Dependence of pollen viability on the period of storage in LN 2



Capsicum Newsletter, 7 (19BB), 32.

FUNCTIONAL MALE-STFRILITY IN CAPSICUM ANNUUM.L

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We are in the process of transferring resistance to powdery mildew (Leveillula taurica)from Capsicum baccatum var. pendulum into bell and chilli peppers, In one of the,segregating backcross progenies two plants were tallt vigoroust with a few dark green, wrinkled, blocky fruits weighing around 15g each. Closer scrutiny of the flowers revealed normal anthers which failed to dehisce. Pollen was collected from the anthers by slitting open the sides. Viability was assessed to be over 90Y.. Pollen ormination wall also normal. Ovules were observed in the ovary. However, the fruits did not yield any seeds indicating parthenocarpic develODMent. The style was almost non-existent and selfing was unsuccessful. Pollen of other lines also did not induce seed set. Pollinating styles grafted from normal flowers using lanolin paste was also of no avail.

Using pollen from this variantt successful seed set was obtained with bell and chilli pepper crosses. The flowers in F, were normal indicatinc; the recessive nature of this variant. With hopes of spotting plants with non-dehiscent anthers and v-ith normal gynceciumt the first segregating generation has been raised. Such a functional male sterile line would be of use in cutting dovm emasculation costs in hybrid seed production programnes.

Capsicum Newsletter, 7 (1988), 33-34.

L^3 GENE AS MARKER IN THE-NATURAL CROSS-POLLINATION EXPERIMENT

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Last three years we studied the natural cross-pollination percent in pepper, using the different not allelic anthocyanin less marker genes, and segregated to genic male sterility. The experiment fields were in Hungary and in Italy. The results suggested that the fertile flowers receiVed few pollen from the neighbour plants, that is the natural cross-pollination percent (ncp) were not so high. The minimum ncp was 1,1 %, the maximum ncp 11,3%, the average of ncp 3,8 % in the fertile plants. Csillery et al. 1986.

The separation of recessive anthocyanin less (al) hypocotyl from the dominant normal lilac al+ hypocotyl is very simple, therefore these results came from the analysis of several thousends al and al+ seedlings. We hope that the results are correct, but we can not exclude that the anthocyanin less gene has some influence on the natural cross-pollination. For example in some biochemical component the al type of flowers, pollen or nectar are more favourable for the bees. Therefore we looked for another marker gene without any phenotypical differente.

The Aal ms-3 0 L+ line (100% anthocyanin less; 50% male sterile: 50% male fertile) - which we used in the former experiments- is TMV susceptible, but we have another line, which contain the same al and M_ gene, plus the dominant L3 gene, therefore it is homozygote TMV resistant.

The transplantation system was the following: 5 rows Aal ms-3 0 L3 items +
1 row Aal ms-3 D L+ item + 5 rows Aal ms-3 D L3 items + 1 row Aal ms-3 D L+ item etc. One row was 6 meter long and the total experiment consisted of 120 rows,.We harversted only the Aal ms-3 D L+ items, but we signed which plant was male sterile and male fertile. We measured the fruit size and then took out the seeds. The seeds were sown and the young seedlings were infected with ToMV-Ob strain in the cotyledon phase. The results are in the table 1.

it seems to me that the former results were correct and in the fertile plants the ncp is under 10% in Hungary.

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Table 1. Natural cross-pollination experiment with Aal ms-3 0 L' and Aal ms-3 D L^3 items in Nagyszenes (Hungary) 1988.

Items	Fruit size l1w in cm	Seed/fruit	Susceptible seedlings	Resistant seedlings	ncp %
154 fruits from sterile plants	16,2/3,6	80,5	3762	4285	100 (53,2 L^3 plants)
64 fruits from fertile plants	14,6/3,7	152,4	5157	79	1,5

Capsicum Newsletter, 7 (1988), 35-36.

RESULTS OF GENETIC ANALYSIS IN **SWEET PEPPER (Capsicum annuum L.)**

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Successful breeding programe for the crop improvement is largely related to availability of comprehensive information of the geretic architecture of plant characters sought to be improved. The present studies were therefore undertaken to work out genetic analysis in sweet pepper (a diallel set of 9x9 F1 crosses of the material planted as has been reported by Joshi, 1986) for evaluating different traits which will be helpful in evolving suitable variety(ies)/ F1 hybrids. The analysis of genetic variance components revealed significance of
both addittive and non-additive genetic variance for the expression of 11 characters studied. Genetic components of diallel have shown a relatively bigber estimates of domillant gene action and preponderance of over-dominance. This finding also gets support from the significant inbreeding depression noticed for many traits in most of the cross indicate to dominant type of gene action in sweet pepper which is a self pollinated crop, Joshi (1987). The comparative evaluation of the results on average degree of dominance for eleven characters (table) has a general agreement for major contribution by the dominance type of gene action. It is therefore sugested that heterosis breeding which is feasible in this crop because of prevalance of the high magnitude of non-addditive gene efffects for major yeild contributing traits as revealed by this study and also reported by Joshi (1986) and and many others. Imporvement by some form of recurrent selection method would also be most desirable breeding procedure for sweet pepper.

Table Comparative Evaluation of the results on average degree of dominance for eleven characters in 9x 9 diallel cross.

Characters	G raph i c al analysis	Va ri ance component anal ysis		Combi-ning ability variances		Average degree of dominance	
		D	H_1	gca	sca	Wr-Vr	(H1/D) graph
Days taken to 75 % flowering	Dominance	NS	NS	NS	HS	OD	OD
Plant height	Dominance	NS	S	HS	HS	PD	OD
Number of primary branches	Dominance	NS	NS	S	HS	OD	OD
Days to first picking	Dominane	NS	NS	HS	HS	PD	OD
Early yield per plant	Dominance	NS	S	HS	HS	OD	OD
Length of the fruit	Dominance	NS	S	HS	HS	PD	OD
Circumference of the fruit	Dominance	S	S	HS	HS	PD	PD
Number of fruits per Kg	Dominance	S	S	HS	HS	PD	PD
Average frult weight	Dominance	NS	NS	HS	HS	PD	OD
Number of fruits per plant	Dominance	NS	S	HS	HS	OD	OD
Yield of fruits per plant	Dominance	S	S	HS	HS	OD	OD

S, Significant; HS, Highly significant ; NS, Non-significant; PD, Partial Dominance ; OD, over Dominance

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Capsicum Newsletter, 7 (1988), 37-38.

PATH COEFFICIENT ANALYSIS IN SWEET PEPPER

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ABSTRACT

A path coefficient analysis of the correlation between different characters was made using*21 sweet pepper va rietios.from different countries, planted in optimal season at "Liliana Dimitrova" Horticultural Research I.113titute. A causal system was used in which yield per plant was the effect. There were high direct effects of mean fruit weight, number of fruits per plant and fruit width on yioldq pointing out the Importance of these characters in pepper breading. The absence of corrolation of these characters with yield was due in this case to high negative indirect offects,on these characters studied in this paper.

Table 1. Direct and indirect effects on yield.

Plant height	Plant width	Fruit length	Fruit width	Length/ width	Pericarp thickness	Soluble solids	PH	No fruits/ plant	Mean fruit weight
				Total correlation					
0,2369	0,2595	0,2159	-0,0883	0,1534	-0,2247	-0,0074	0,2270	0,3297	0,1485
				Direct effects					
0,0775	0,2053	0,4295	0,9182	-0,3243	0,2043	-0,1242	0,1803	0,9639	1,0946
	Residential effect: 02366					Indirect effect: Plant height			
	0,0409	-0,0221	-0,0075	-0,0140	-0,0462	0,0034	-0,0082	0,0125	0,0040
				I.E. Plan Width					
0,1084		-0,0735	-0,7032	-0,0231	-0,1381	-0,0088	-0,0645	0,0479	-0,0271
				I.E. Fruit Length					
-0,1229	-0,1539		-0,1003	0,3539	0,1484	0,0908	0,1886	0,0794	-0,0669
				I.E. Fruit Width					
-0,0898	-0,3145	-0,2144		-0,6547	0,4609	0,0397	-0,0152	-0,6580	0,7368
				I. E. Length/width					
0,0589	0,3653	-0,2673	0,2312		-0,0042	-0,0420	0,0911	0,1781	-0,1881
				I.E. Pericarp thickness					
-0,1213	-0,1368	0,0703	0,1021	0,0025		0,0610	0,0338	0,1193	-0,0996
				I. E. Soluble solids					
-0,0055	0,0053	-0,0262	-0,0053	-0,0161	-0,0372		0,0064	0,0094	-0,0138
				I.E. PH					
-0,0991	-0,0566	0,0791	-0,0029	0,0506	-0,0299	-0,0093		-0,0551	0,0375
				I. E. No fruits/plant					
0,1559	0,2250	0,1782	-0,6908	0,5295	-0,5653	-0,0735	0,2947		-0,7533
				I. E. Mean fruit weight					
0,0575	-0,1447	-0,1704	0,8784	-0,6352	0,5364	0,1221	-0,2282	-0,8555	

Capsicum Newsletter, 7 (1988), 39-40.

GENETIC, CONTRIBUTIONS TO HIGHER PRODUCTIVITY AND STABILITY OF YIELD IN RED PEPPER.

V.P. TEWARI Division of Genetics Indian Agricultural Research Institute, New Delhi*

Chilli varieiy 'Posa JWalal possessing field tolerance to viral diseases with super heavy yield has pla ed a significant role in stabilising ' chilli production in India Trie role of 'Pusa JWalat and other Improved chillies is shown in histo ram in which the varieties under distribution by National Seeds Corporation are shown by solid lines. 'Pusa JWalal is a very popular variety with greater acreage as compared to other cultivars all over the country, The role of Improved chillies has been shown in three distinct phases of 6 years each:,. The increase in productivity and stability is seen in phase II and phase 114 the post release periods-of 'Pusa Jwalal; the superior charactors which have been mainly responsible for enhancing yield potential and the stability of production are given belows

1. The virus tolerance of 'Pusa Jwalal ha's been mainly responsible for stabilizing production at National levelt since most of the varieties in cultivation we susceptible to viral diseases (Tewari,, g.Ramanujan, 1974).
2. 'Fusa Jviala I has given better performance when grown under better agronomic management practices as a result of greater respond to inputs (Tewari, 1987).
3. The higher harvest index has-also contributed to higher productivity of Pusa Jwalal as compared to other chilli cultivars (Monkar Rao & Gupta 1981).

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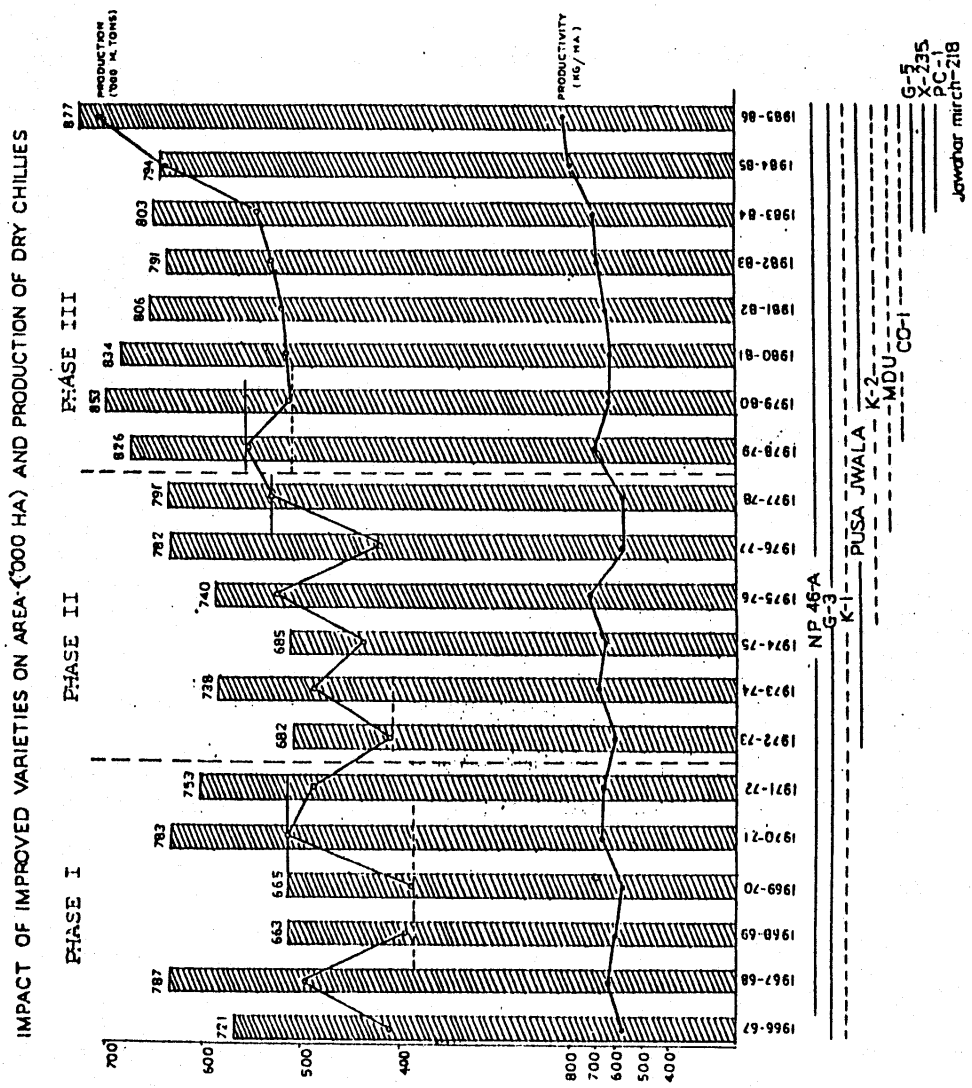
IMPACT OF IMPROVED VARIETIES ON AREA ('000 HA) AND PRODUCTION OF DRY CHILLIES
PHASE I
PHASE II
PHASE III
PRODUCTION ('000 M. TONS)
PRODUCTIVITY (KG/HA.)
721
787
663
665
783
753
682
738
685
740
782
791
826
853
834
806
791
803
794
877
1966-67
1967-68
1968-69
1969-70
1970-71
1971-72
1972-73
1973-74
1974-75
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1981-82
1982-83
1983-84
1984-85
1985-86
700
600
500
400
800
700
600
500
400
NP 46-A
G-3
K-1
PUSA JWALA
K-2
MDU
CO-1
G-5
X-235
PC-1
Jawahar mirch-218

40

Capsicum Newsletter, 7 (1988), 41.

GENETIC IMPROVEMENT OF CAPSICUM CONTENT IN HOT PEPPER (Capsicum frutescens L.)

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Indian chillies have moderate pungancy with dapasaicin 0.2 TO 0.3 per cent and are not susitable for the manufacture of high capsicin oleoresin for pharmaceuticals and export. The capsaicin content of 'Pusa Jwala' is 0.7 per cent, thus is a prized raw material for manufacture of high capsaicin oleroesisn in the owrld market (Govindrajan 1985).

Almost all the chilli cultivars planted on field scale in India belong to Capsicum annuum. They are usually early maturing, grown as annual and are less pngent than perrenial chillies. The perrenial chillies. The perennial chilli and are rarely cultivated on field scale are known as 'bird chillies' and belong to C. frutescens. These highly pungent chillies are official the British pharmacopaea and find maxiumum use I pharmaceuticals. The production of 'bird chillies' is rather limited because of poor yields and difficulty in harvest.

Realising the value of bird chillies intensive efforts have been made to select superior lines in population of "bird chllies'. 'Pusa Sadabahar' (PSP-11) is a superior quality chilli with 12.0 per cent capsaicin content in oleoresin as copared to 8.0% of capsicin in besides use as green & dry chillies it can also be used for the manufacture of chilli oleoresin (Anonymous, 1986). This variety opened a new era in chilli deelopment, since the earlier demands of oleoresin chillies wit 3% capsaicin seems to have vanished but the demands for oleoresin wit 6-10% capsaicin is increasing in the owrld market. 'Pusa Sadabahr' with 50 per cent more capsaicin in oleoresin as compared to 'Pusa Jwala' may prove to be an outstanding raw material for the manufacture of high capsaicin oleoresin for export.

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Capsicum Newsletter, 7 (1988), 42-43

HERITABILITY IN SWEET PEPPER

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The predirtive role of heritability values is an important funchtion in genetic studies of lant characters. This apect can be usilized for aking selection in sweet pepper more effective. Estimates of hetitability for yield and its components were computed by the method proposed by Warner (1950); Right varieties of sweet pepper their F1, F2, BC1 and BC2 generations were used in the present investigabtion conducted during the year 1980.

Estimate of heritability for days to first haresting was the highest. This was followed by average fruit weight, plant height, number of branches per lant, fruit shape index, number of fruits per plant, days to flowering and flesh thickness respectively (Table-1). Heritability estimates for early and total yield were medium which coincided with the findings of Abou-Kl-Fdl (1979). Since yield is a complex character it is liable to have more invironmental influence resulting in to low or medium estimates of heritability.

Sumarized informatio from the present studies indicated that selection for earliness based on days to flowering and days to flowering and days to first harveting would be quite effective. The prospects of imporvement in rest of the characters except early and total yield per plant are also high. Since average fruit weight and number of fruits per plant the major component of yield have higher estimates of heritability, selection based on these characters would bring considerable improvement in yield.

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Table –1 Estimates of heritability for yield and its components in sweet pepper.

	Character	Heritability
1.	Days to flowring	68.93
2.	Plant height	75.67
3.	Number of branches / plant	73.66
4.	Number of fruits / plant	70.72
5.	Average fruit weight	77.43
6.	Fruit shape index	71.03
7.	Flesh thickness	67.37
8.	Days to first harvesting	78.93
9.	Early yield / plant	54.79
10.	Total yield / plant	57.91

Capsicum Newsletter, 7 (1988), 44-45.

RESULTS OF SOME QUALITY ASPECTS IN HOT PEPPER PROCESSING IN TUNISIA.

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Pepper is an important vegetable crops in Tunisia and is used as green pepper, red powder or as "Harissall, which is a hot paste. The pepper at complete maturity is very important for processing.

A genetic programme for a processing pepper started since 1978. The aim of this study is to create a variety easy to harvest including the genes ep(easy picking), up(straight fruit), fa(fasciculatum) and the gene c (high pigment concentration); and regarding the technology needed to produce "Harissall, the acidity is also taken into account.

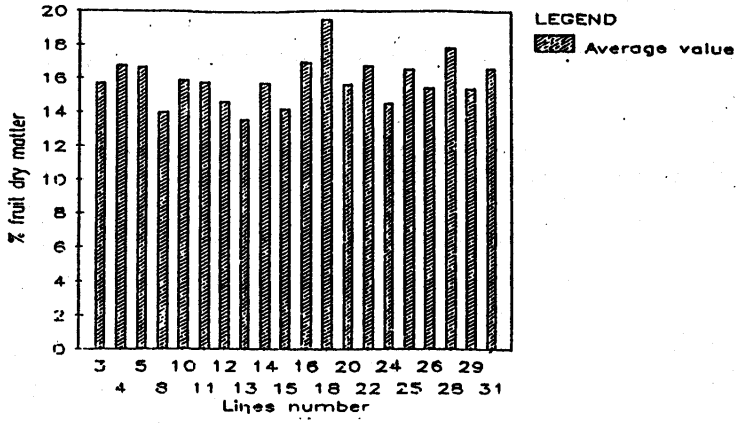
For this purpose, we made crosses between three varieties 'Anaheim Ml,'SM 477'(Var. fasciculatum) and'LPf.

Twenty F breeding lines were selected for studying morphological anY biochemical parameters. We present hereinafter, three parameters nearly correlated with processing pepper, either red powder or "Harissall i.e. dry Matter, Absorbance and Acidity.

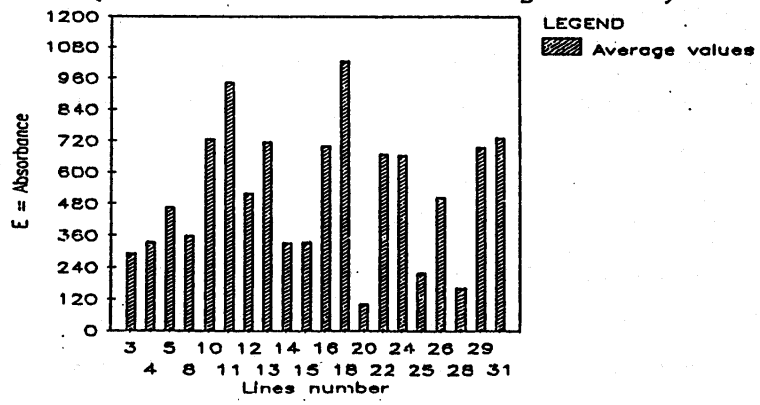
Preliminary observations show that the response of the lines tested is very heterogeneous. In fact, some lines presented good results in dry Matter and Absorbance but high level of Acidity; in this case, this lines have predisposition f6r red powder processing. As shown in Fig.1 & 2, the lines 10, 11 and 18 presented good average values.

Some other lines further presented good values of Acidity. These Values satisfy the Tunisian norm's expressed as Citric Acid which do not exceed 1.8% of the dry Matter. The lines 22, 29, and 31 presented good results either for use as red powder or “Harissa” processing.

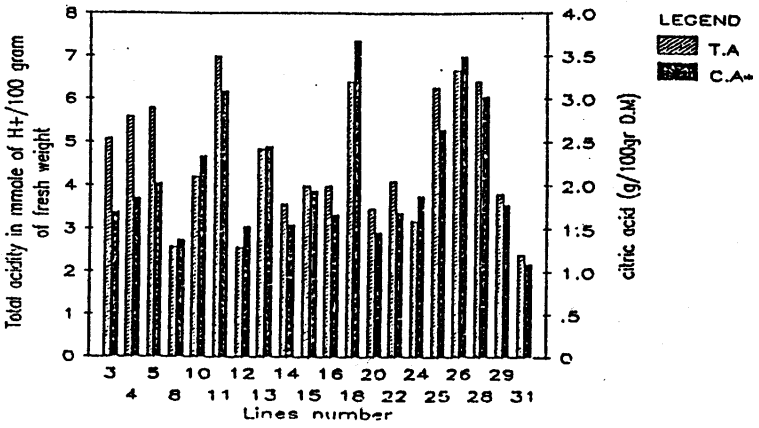
Average value of the % of the fruit dry matter in gram



Average values of the absorbance measured at 470 millimicrons (Evaluation of the coloring matter)



Average value of the total acidity and the % of citric acid



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Capsicum Newsletter, 7 (1988), 46.

GENOTYPIC VARIABILITY IN FRUIT CHARACTERISTICS OF PEPPER (Capsicum spp.)

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Ten cultivars of Capsicum annuum L. and fifteen cultivars of C. frutescens L. were grown in a randomized complete block design with four replications for C. annuum and three replications for C. frutescens at Samaru (11°11'N; 07°38'E).

Data were collected on six fruit traits for C. annuum and eight fruit traits for C. frutescens. The traits which showed high levels of variation were total fruit number per plantv weight per fruit and yield per plant in C. annuum while in.C. frutescenst the traits with high levels of variation were weight per fresh fruit, 100-seed weight* fresh fruit yield per plant# total fruit number per plant and dry fruit yield per plant,

Analysis of variance indicated highly significant differences for all the traits in C. annuum but in C. frutescens total fruit number per plant and 100-seed weight did not show significant differences among the cultivars. The highly significant differences indicated the presence of genotypic variability in the cultivars.

Capsicum Newsletter, 7 (1988), 47-48.

PRELIMINARY SURVEY OF CHILI CULTIVARS (Capsicum spp)

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In-the "Fabio Baudrit Agricultural Experimental Center" a farming study of twelve chili varieties was done. This survey took into consideration agronomic aspects such as some fruit characteristics and yield.

It was found.that the "8995" and "6642" cultivars showed the largest amount of fresh fruits.

The greatest production of dry fruits with an average capsaicin content was obtained by growing the "781011 variety. But it proved a low yield of fresh fruits and undersirable properties in regard to blooming days and the poor visibility of the fruit exposure degree in plants.

The content of the capsaicin alkaloid in dry fruits was related to the diameter, length and thickness of fresh fruits. It was also discovered that there is an inverse relation between the alkaloid percentage and these characteristics.

Finally, it was not found any significative connection among the fresh fruit quantity and plant height to the capsaicin content.

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Table 1. Evaluation on chilli cultivar characteristics according to the 5% Duncan test.

CULTIVARS	VARAIABLES						
	TOTAL AMOUNT TON/HA	PLANT HEIGHT AVERAGE cm	FRUIT DIAMETER AVERAGE cm	FRUIT LENGTH AVERAGE cm	FRUIT THICKNESS AVERAGE mm	DRY FRUIT YIELD BY KG/500 g OF FRESH FRUIT	DRY FRUIT CAPSAICIN CONTENT %
6642	10,68ab[1]	55,30bc	2,38b	7,15d	3,54a	0,08235f	0,1875d
7810	5,04c	56,70bc	1,04e	3,85gh	1,16gh	0,22078a	0,3700b
7813	7,83abc	50,62c	2,65a	7,93c	2,21d	X	x
8052	7,53abc	57,23bc	0,73f	5,34e	1,12gh	0,16255b	0,4275a
8064	4,09c	53,28bc	1,76c	5,29e	3,05b	0,10120e	0,2900c
8995	10,90a	53,49bc	1,89c	11,18a	1,70f	0,13502d	0,1225e
9115	8,77abc	56,97bc	2,69a	3,09i	2,09de	X	X
9925	6,86abc	57,62bc	1,12e	4,17g	1,35g	0,14175cd	0,4200a
10078	8,03abc	48,18c	1,47d	4,66f	2,62c	X	X
10628	7,43abc	58,23abc	0,74f	5,24e	0,99h	X	X
10916	7,86abc	63,06ab	0,84f	3,66h	0,89h	X	X
Malayo	8,05abc	68,79a	1,82c	10,02b	1,89ef	0,15032bc	0,1775d

1. Cultivars followed by the same letter do not show any statistical difference.

* No tests were done on these variables.

Capsicum Newsletter, 7 (1988), 49-50.

RESULTS OF HETEROSIS BREEDING ON CHILLI (CAPSICUM ANNUUM L.)

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In a diallel analysis, the performance of 45 F1 hybrids involving 10 chill-4 cultivars selected from divers, groups were compared to estimate the extent of heterosis for yeild nd its components. The material wa planted at Horticultural Research Station, Orissa University of Agriculture and Technology, Bhubaneswar during Rabi 1987-38. Results revealed (Table) that the mean of F1 hybrids was more than that of parents ina ll the characters except in days to 50% flowering and days to 50% maturity, because of early floweing and early maturity. The best performing F1 hybrids were in general better than their respective best parents. There was high degree of heterosis for dry yield per plant. In order of merit J-219 x C.A. 586 ‘Pusa Jwala’ x ‘Sindur’ and B-R. ‘Red’ x G-4 hybridds appear to be best performing for dry yield per plant with 110.38, 98.11 and 89.79 per cent heterosis over their respective best parents. One of the significant findings of present study was that crosses of poor x poor yielding parents showed the maximum heterosis over fruits per plant. The same is also true with repsect to number of fruits per plant. It would be worthwhile to exploit heterosis of the best crosses fro dry yield per plant and number of fruits per plant through heterosis breeding which is quite feasible in this crop due to its per hectare low seed rate condiderable high number of seeds caan be obtained from a single fruit.

Table – Mean values in parents, F1 hybrids and their heterosis percentage for quantitiative characters in chilli

Character	Mean		Average heterosis percentage	Top parent (value)		Best performing F_1 hybrid		
	Parent	F_1				Combination	Value	With heterosis % over better parent
Plant height (cm)	42.33	43.40	2.527	K.C.S-1	(49.67)	Sindur x Lam-x-235	53.38	22.43**
Plant spread (cm)	35.12	35.76	1.822	K.C.S-1	(44.45)	J-218 x S-118-2	46.00	36.49**
No. of primary branches	3.77	4.56	20.951	Pusa Jwala	(4.33)	Pusa Jwala x Lam-X-235	6.30	75.00**
50% flowering (day)	29.53	25.88	-12.360	Pusa Jwala	(24.00)	J-218 x Lam-X-235	15.33	-45.23**
50% maturity (day)	82.50	73.99	-10.315*	K.C.S-1	(75.67)	K.C.S-1 x Sindur	63.00	-27.62**
Fruit length (cm)	8.21	9.23	12.424	B.R. Red	(10.53)	J-218 x C.A. 586	11.79	63.85**
Fruit circumference (cm)	3.15	3.46	9.841	Sindur	(3.80)	S-118-2 x Lam-X-235	4.02	47.07**
No. of fruits per plant	30.03	33.26	10.756	Lam-X-235	(42.40)	J218 x C.A. 586	48.02	66.66**
Weight of 10 fresh fruits (g)	31.40	32.35	3.025	K-2	(38.07)	B.R.-Red X S-118-3	43.43	50.98**
Weight of 10 dry fruits (g)	.7.73	8.22	6.338	K-2	(9.33)	S-119-2 x Pusa Jwala	10.03	56.77**
Dry yield per plant (g)	23.32	28.05	20.283	Lam-X-235	(31.19)	J-218 x C.A. 586	41.82	110.88**
Seed weight per fruit (g)	0.36	0.39	8.34*	Sindur	(0.44)	S-118-2 x Pusa Jwala	0.47	85.52**
No. of seeds per fruit	58.61	66.67	13.752**	J-218	(73.07)	S-118-2 x Pusa Jwala	85.57	80.01**
Weight of 100 seeds (g)	0.57	0.61	7.017**	K-2	(0.64)	B.R.-Red x S-118-2	0.82	51.85**

* Significant at 5% level

** Significant at 1% level

Capsicum Newsletter, 7 (1988), 51.

DEVELOPMENT OF A DETERMINATE9 CLUSTERED BELL PEPPER FOR ONCE-OVER HARVEST

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'Efforts to develop a Bell Pepper cultivar suitable for once-over hand or mechanical harvest have been conducted by numerous researchers in the past. Problems associated with this plant archetype include small fruit size and sunscald of the fruit caused by poor foliar coverage.

Crosses made in 1985 between IMI-2211t a determinate "Umbrella" yellow banana pepper, and 'Early Thickset', a hybrid green bell pepper, have yielded several promising lines. These A and F7 lines exhibit early maturity, a concentrated set of 3-5 medium sized (approximately 6cm x 9cm), bell-shapedp yellow-green fruitv and adequate foliar development to protect against sunscald. These lines would be suitable for short season, high density plantings.

Additional crosses between these and other lines are being evaluated in an effort to select higher yielding isolates with multiple disease resistances and dark green fruit color.

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Capsicum Newsletter, 7 (19B8), 52-53.

GENE ACTION IN SIX CROSSES OF PEPPER (Capsicum annuum L.)

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Six different crosses were made between five parental varieties obtained from local farmers. The F 1 Is were raised and advanced to F 2 Is. The five parents, the six F 1 Is and their F 2 Is were grown in the field in order to find out the relation between the performance of the plants in the three generations under normal agricultural practice. The results were used to study the nature of gene action governing the three traits considered.

Table 1 shows mean performance of the three generations in the crosses. Yield per plant indicate that the F1 of the cross S02 x K.D3 was higher than either of the parents and intermediate between tile parents in the other five crosses. In all crosses the F1, yields were higher than the respective mid-parent values. This indicates partial dominance of the higher yielding pa'rants. The F2 yields were lower than the corresponding F1, yields in all crosses even though the differences were small. The absence of inbreeding depression in tile F2 Is relative to the F1 is suggests that considerable additive genetic variation is available for yield per plant in the crosses.

For plant height, in three crosses, the F1 is were shorter than their respective mid-parent values indicating partial dominanatof the short parents. In four of the crosses, the mean heights in the F2 Is were less than the F1 is indicating some degree of inbreeding depression.

For days to maturity, in two crosses, the F1 Is were later maturing than their late paxents indicating over-dominance for the character.

Table 1: Mean performance of three generations for three traits in six crosses of pepper (Capsicum annuum L.)

Cross	Generation	Characters Yield/ plant (g)	Plant height (cm)	Days to flower	Cross	Generation	Character Yield/ plant (g)	Plant height (cm)	Days to flower
	P1*	236	60	87		P1	230	47	85
	P2	230	47	85		P2	236	60	87
KD3 x SO2	F1	235	53	84	SO2 X KD3	F1	240	55	84
	MP	233	54	86		MP	233	54	86
	F2	234	50	83		F2	236	56	85
	P1	310	50	85		P1	245	57	87
	P2	236	60	87		P2	310	50	85
KD4 x KD3	F1	235	64	88	KN3 X KD4	F1	284	55	85
	MP	273	55	86		MP	278	54	86
	F2	284	56	84		F2	283	54	84
	P1	210	50	85		P1	245	57	87
	P2	300	50	90		P2	230	47	85
KD4 x SO1	F1	307	48	89	KN3 X SO2	F1	240	56	89
	MP	305	50	88		MP	238	54	86
	F2	305	46	88		F2	238	55	87

*P1 = Parent 1, P2 = Parent 2 (male), F1 = 1st filial generation, MP = mid-parent, F2 = 2nd filial generation.

Capsicum Newsletter, 7 (1988), 54-55.

PIGMENT FRUIT SPECTRMI OF F 1 AND 13C 1 P 2 ITYBRIDS BETWEEN CAPSICUM ANNUMI AND C.CHINENSE

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Carotenoid pigments of ripe F_1 and BC_1P_2 hybrid fruits from the cross between red fruited C.annuum f.nigrut and orange fruited C..chinense were extracted and separated by TLC after the previously described method (Chalulcova et al. 1987). TLC carotenoid pigment spectra of the parental species and of a part of the investigated hybrid plants are given in Fig. 1. The pigment composition of F 1 was homogenous and similar to that of tho. red fruited parent with certain differences in the context ratio of some pigments. As compared to C.anxiuwn the part of component 3 was higher, while that of components 10-11 was lower. Two groups of fruit color segregation were observed in PC I P 2 0 Red fruited plants had the same qualitative carotenoid composition as the cultigens, but considerable quantitative differences were available. The share of 13-carotene and of yellow xanthopbyls increased on account of the red xanthopbyls. Orange fruited plants had the same qualitative pigment composition as C.chinense, but quantitative differences were also evident. The ratio between components 2 and Avas similar to that of' C.annuum. and in some DC I P 2 plants the share of component *3* Was very high.. A part of the hybrids differed from one another and from C.chinense in their content of components *h-6* as compared to the level of component group *7-9.*The discussed experimental results show that hybridization between C annuum and C chinense leads to considerable changes in the. phenotypical expression of the genes controling the separate stages of carotenoid biosynthetic pathway.

REIFERENCES C"ALUKOVA M. I PUNDEVA R. p LUICARSKA E. 9 19879 TLC-spectrzx of caroL-enoid fruit pigment-s in some 2epper speciesp Capsicum Newsletterp 6, 21-22.

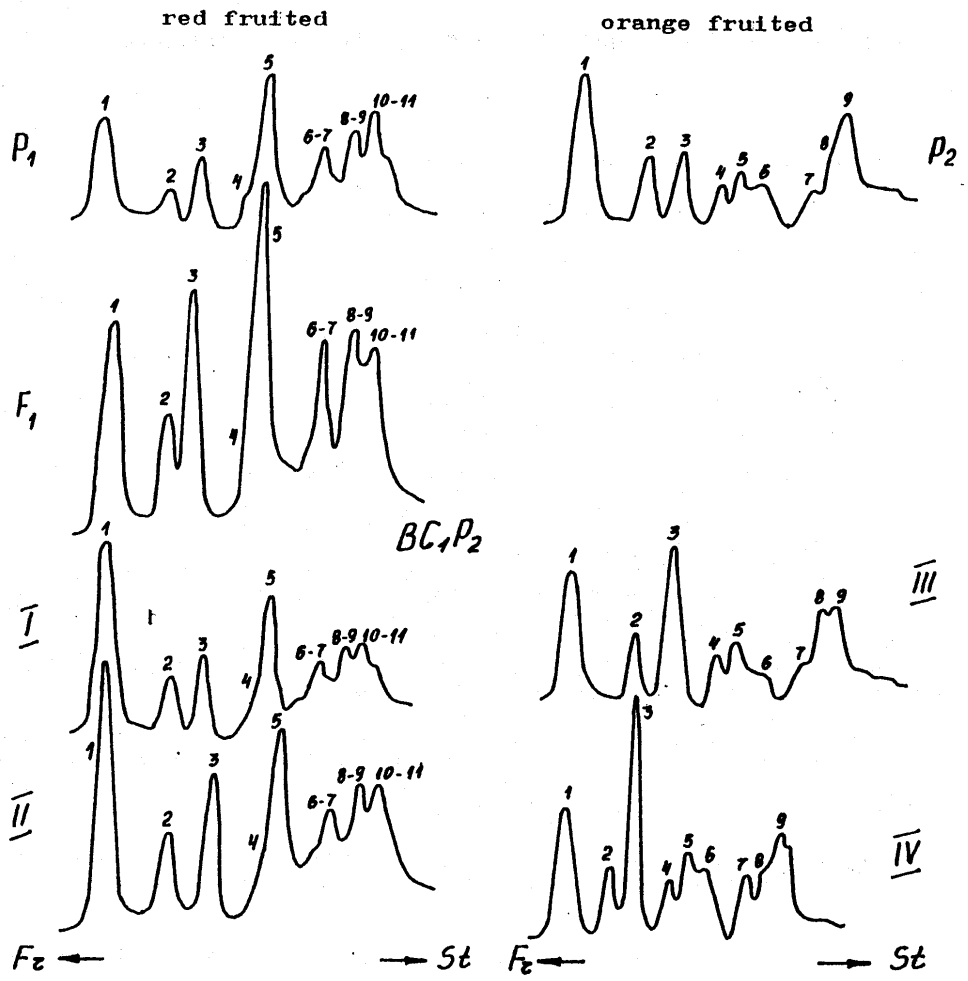

Fig 1. TLC-caratinoid fruit spectra of p1, P_2, F_1 and BC_1P_2 .
Pigments of red fruits : 1 – β-carotene; 2,3,7,9 – yellow xanthophylls without epoxide groups; 4,5,6,8,10,11 – red Xanthophyls (capsanthin, capsorubin, etc.).
Pigments of orange fruits : 1 – β-carotene; 2-9 – yellow xanthophylls: 2,3,8 – without epoxide groups; 4,6,7 – with one epoxide group; 5-9 – with two epoxide groups.
(Pigments with similar characteristics – mobility, colour, absorption spectra, are designated by the same number)

Capsicum Newsletter, 7 (1988), 56-57.

RELATIONSHIP BETWEEN POSTHARVEST WATER LOSS AND EPICUTICULAR WAX OF PEPPER FRUITS

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Water loss appears to be the major factor limiting postharvest longevity of pepper fruits (5) and, therefore, fresh market distribution. Marked varietal differences in rates of water loss were observed and must be understood to optimize postharvest life and marketability. Fruits, like other aerial plant parts, are covered with a cuticle, composed of biopolymer cutin and embedded wax with epicuticu I ar waxes on the outer surface, which serves as the major barrier to moisture loss (2, 3, 4, 6). Thus, differences in surface morphology of pepper fruits may affect water loss and postharvest longevity.

The epicuticular wax content and percentage weight loss of three pepper varieties, 'Keystone' (bell pepper), 'NuMex R Naky' (long green) and 'Santa Fe Grande' (yellow wax) were determined. Epicuticular wax content was determined by removing 250 disks (2 cm diameter) from mature fruits (4 disks per fruit) of each variety and rinsing the disks (outer surface only) for 5 seconds in 4 successive 80 ml portions of chloroform. The washings from 250 disks were evaporated to dryness at 400C and the weight of wax measured (1). Fruit weight loss was determined by recording the weight of six fruits of 'Keystone' and 'NuMex R Naky' and thirty fruits of 'Santa Fe Grande' divided into three replications. Data were collected daily and expressed as percent weight loss.

Our results indicate that of the three pepper varieties tested, 'Keystone' had the greatest amount of epicuticular wax and the lowest rate of water loss (Table 1). 'NuMex R Naky' and 'Santa Fe Grande' had markedly 1 ess epicuticular wax and lost water at considerably higher rates.

These findings suggest that developing pepper types with greater amounts of epicuticular wax will provide an approach to extending their postharvest life.

Table 1. Epicuticular wax content (at harvest) and percent weight loss for three pepper varieties stored at 80°C for 5 days.

Varieties	Epicuticular wax ---Vg/cm2___	Weight loss
Keystone	129.6	1.7
NuMex R Naky	73.6	2.7
Santa Fe Grande	19.5	4.4

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Capsicum Newsletter, 7 (1988), 58-59.

EFFECT OF STORAGE PERIOD ON GERMINATION OF SWEET PEPPER SEEDS

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Germination of seed is affected by phsiological changes associated with aging and environmental factors like temperature and relative humidity. Somos (1984) has reported deterioration in germinating ability and vigour of paprika seed if stored longer than one or two years. Therfore, present investigation was concluded to find out the effect of aging and safe maximum storage period for sweet pepper seeds.

The sampls considered of 400 seeds of each cultivars of sweet pepper viz. 'California Wonder', 'Russian Yellow' and 'Vinedale' having 6-7 per cent mositure. Seeds in brown waxy paper envelops were stored in steel racks under room temperature)2-26C, RH 45-76%) for periods of 1-5 years at this station situated in temperature climate. Germination tests were carried out at 20 ± 2 °C during 1989 as per procedure given by Aggarwal (1980).

Seed stored for various periods showed significant differences in germination (Table). Germination started from 6-8 days and was over after 16-18 days for the seed stored from 1-3 years, while 4 and 5 years of storage it began after 8-12 days and was completed in 22 days. The older seeds took more time for germination due to reduced vigour. Bognar (1959) also reported that six years storage of paprika seeds emerged in 22 days. Germination ranged from 29.0 – 92.0 per cent. The aging effect might have resulted into poor and slow rate of germination. The decline in germination for three years of storage varied fro 12.5 to 20.3 per-cent among varieties, however, there was steep decrease (51.9-68.4) in 5 years of storage.

Summarised information revealed that seed stored till third year under temperate climate may be utilized safely as it retains the optimum germination standard. Thereafter the aging process considerably reduces and delays germination.

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Capsicum Newsletter, 7 (1988), 60-61.

STUDIES ON BIMAIEMICAL CHANGES ON DETERIORATION IN BELL PEPPER SEEDS

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Bell pepper (Capsicum annuum L.) seeds are short; lived under ambient conditions. Reduction in germination is widely accepted criterion for the seed deterioration, which is predominantly governed by storage conditions. High temperature and mositure hasten the process of deterioration. It is also associated with changes at cellular level which increase electrolytes leaching (Doijode, 1985). The present experiment was conducted to enhance seed longevity by evaluating storage temperatures, and study biochemical changes in seed in relation to loss of viability.

Materials and Methods

Seeds of bell pepper cv 'Arka Mohint' were extra~ted from fully ripe fruits and dried to 6.5% moisture. These seeds were packed in paperfoil-polyethylene laminated bags and stored at 5°C-18°C and ambient temperature. Seeds were tested as per the ISTA procedtire and seedling vigour was compared by means of seedling dry weight. For biochem ical analysis seeds . were surface sterilized with 0.1% mercuric chloride, washed with sterile water, - dried and soaked In 10 nil sterile water for 18 h at 25°C. Electrical conductivity, soluble sugars and free amino acids were determined in seed leachates and dehydrogenase activity hi seeds after five years of storage.

Restilts and Discussion

Seed longevity significantly differed with the storage temperatures. The germination was more than 96% in seeds stored at 5°Cand -18° C as compared to zero in ambient stored seeds (Fig. 1). Low temperature storage maintains seed viability for five years; the dry weight of seedling was higher in seeds stored at -18°C than 50 C. Leaching of electrolytes was more in ambient stored seeds. Similarly loss of soluble stigars and free amino acids were greater in the leachates of ambient stored seeds as compared to seeds stored at 5°C and -18°C.

Dehydrogenase activity was highest in seeds stored at -18°C followed by seeds stored at 5°C. Loss of gertninability was positively correlated with the extent of leakage, which was owing to the damage caused to the cell membrane (Schoettle and Leojold, 1984). These biochemical parameters are useful in quick determination of seed viability. Seed qtiality was preserved by the low temperature in 'bell mpper and seed longevity was enhanced to five years by packing seeds in laminated bags stored at 5°C and -18°C.

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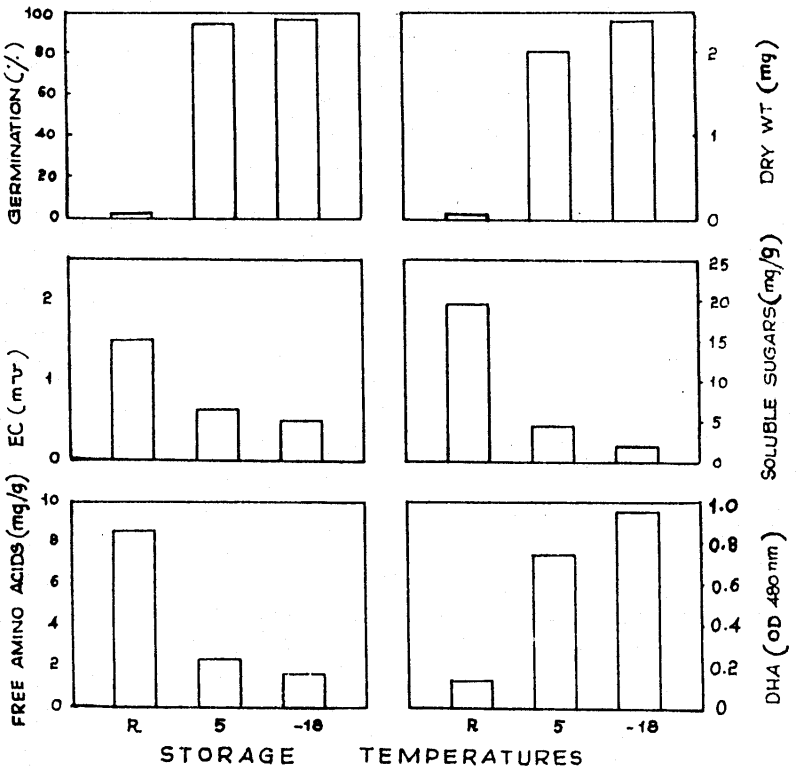

Fig.1 EFFECT OF STORAGE TEMPERATURE ON SEED VIABILITY AND BIOCHEMICAL CHANGES IN RELATION TO LOSS OF VIABILITY IN BELL PEPPER

Capsicum Newsletter, 7 (1988). 62.

PHYTOSTOP – A NEW CULTIVAR RESISTANT TO PHYTOPHTORA CAPSICI

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The cultivar 'Phytostopl was released by the National Strain Testing Board in-1988.

The new cultivar was developed through backcross breeding between the line 151-1 obtained from interspecific hybridization with C. pendulum and the line P-51 resistant to Phytophtora capsici.

The cultivar is possessing horizontal resistance to Phytophtora capsici and Verticillium albo-atrium.

The plants are about 70-80 cm tall with strong stem and 2-3 main branches.

The fruits are dark green, "Kapia" type, smooth, glossy, sweet, weighing 60-80 grams, 14-16 cm long, 4-5 cm wide, with 2-3 locules and the thickness of the pericarp is 3-5-4.0 mm.

The fruits are characterized by good transportability and possibilities for long storage.

The seeds are comparatively small in size.

The cultivar 'Phytostop' is suitable for middle early and late field production especially for areas which are vulnerable to Phytoptora capsici.

Capsicum Newsletter, 7 (1988), 63-64.

THE EFFECT OF GROWING MEDIA ON NEMATODE EGG PRODUCTION WITH RESISTANT AND SUSCEPTIBLE PEPPER CULTIVARS

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In New Mexico, it is estimated that nematodes, Meloidogyne incognita, are responsible for a 15% economical loss in peppers, CapsicuLn Annuum. Nematodes may be controlled by nematdcides, but they are daily. A solution to the nematode problem is genetic r'esistance, which has been found in pepper (2). However, it is necessary to have a reliable screening technique for detecting root knot nematode resistance.

For evaluation of nematode resistance in pepper seedlings, a nematode resistant 'Carolina Cayenne' and a nematode susceptible 'NuMex R Naky' cultivar were grown in two different media, a soilless peat moss-vermiculite and a loamy sand soil. Flats were set on a thermostatically controlled heater mat, placed in a temperature controlled greenhouse with ai temperature of 290 $\pm$ 60C. Four-week-old plants growing in cells of 90.0 cm were inoculated with 2500 nematode eggs of M. incognita. Nematode eggs were obtained from infested roots of 'Rutgerl tomato by following the methodology described by Barker (1). Plants were evaluated 40 days after inoculation using a 0 to 5 disease severity scale. The formula (3) to calculate the gall index was:

$$\text{G.I.} \quad \frac{[(\#\text{plts in class 1} \times 1)+\ldots+(\#\text{Plts in class 5} \times 5)]}{\#\text{ plants in treatment} \times 5} \times 100$$

Fewer nematode galls developed on the resistant 'Carolina Cayenne' as compared to the susceptible 'NuMex R Naky'. The gall indices for 'Carolina Cayenne' and 'NuMex R Naky' were 24% and 76%, respectively. Egg production was also evaluated for both pepper cultivars and growing media. A significant interaction was observed between those factors. Loamy sand soil was more effect for testing susceptibility to nematodes than soilless media. When the cultivars were observed in loamy sand soil, 'NuMex R Naky' was significantly greater in egg production than 'Carolina Cayenne'. Figure 1 depicts the interaction.

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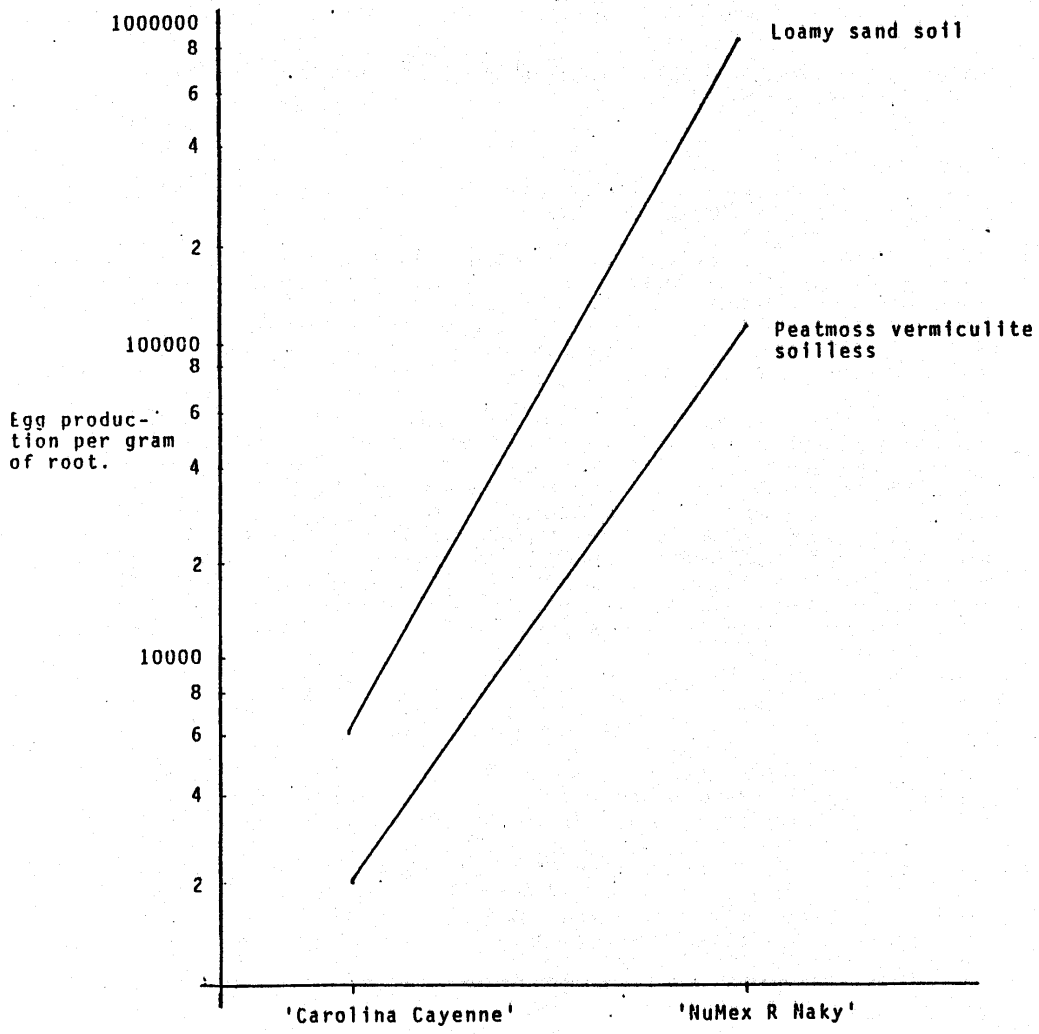

Figure 1.
Nematode egg production comparing effect of cultivars and growing media.

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Capsicum Newsletter, 7 (1988), 65-66.

RESPONSE OF PEPPER TO TWO SPANISH ISOLATES OF CMV

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The resistance of the variety 'Perennial' (SINGH and TAKHUR# 1977) to a Spanish isolate (CMV-1975) of Cucumber Mosaic Virus (CMV) obtained from 'Yolo Wonder' was reported by GIL ORTEGA and LUIS ARTEAGA (1982). Later, a new isolate of CMV (P-22-82) was obtained by the authors from an outdoor growing plant of 'Perennial' showing necrotic ring spot and mosaic symptoms.

In December 1986, some varieties reported as CMV-resistant CRM 21/83' and 'RM 32/83' from Smed. Palanka, Yugoslavia, '3522-2' ' from Vilmorin and 'Israel CMV' obtained from A.A.COOK) were inoculated with the two above mentioned isolates of CMV. Sensitive ('Morr6n INIA 1061) and tolerant ('Perennial') controls were included. Visual symptom recordings were performed during the following winter and spring. 'Perennial' continued showing the highest resistance level though displaying a certain heterogeneity for that character which should be more properly termed as tolerance, since the back-inoculations carried out from 'Perennial' plants without symptoms revealed the presence of the virus. This is in agreement with the results of POCHARD et al. (1983) and SHIFRISS and COHEN (1986). Among the remaining studied varieties, 'Israel CMV' and 'RM 32/83' could be pointed out by their tolerance though their response was clearly below the level of 'Perennial'.

The heterogeneity of the tolerance to CMV displayed by 'Perennial' had already been observed by us in previous inoculations. Thus, a pedigree selection for tolerance to CMV in 'Perennial' had already been carried out. Five lines selected in this way were included in the inoculations of December 1986. One of the five 'Perennial' lines behaved as the most tolerant but each one of them showed about the same level of tolerance to isolate 'CMV-1975' than to isolate 'P-22-821. Therefore we concluded that isolate 'P-22-82' should not be considered a specialization of the parasite to attack 'Perennial'. That suposition is supported by the fact that this variety, being tolerant and not resistant, could display slight symptoms on some plants under certain circumstances.

When making pedigree selection for higher tolerance to CMV in 'Perennial', logically, a higher homogeneity in other characteristics was obtained, in our case a more erect plant habit and a smaller fruit size.

In December 1986, the F 1 and F 2 of the crosses 'Morr6n INIA 106' x 'Perennial' and the reciprocal one were included in the inoculation with the isolate 'CMV-1975'. The responses of F 1 and F 2 agrees with the hypothesis that supposes the character studied as polygenic (RUSKO and CSILLERY, 1980; POCHARD et al., 1983; SHIFRISS and COHEN, 1986).

According to the above results, it can be concluded that 'Perennial' continues to be the best material we know by its level of tolerance to CMV.

(1) Works presented here have been partially sponsored by CICYT and INIA

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Capsicum Newsletter, 7 (1988), 67.

HOT PEPPER VIRUS DISEASE IN THE GULF OF MEXICO

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In Mexico, the first pepper virus disease was reported during 1966 at the Huasteca Region. Actually, virus diseases are affecting the production with about a 20 to 100% of infection levels in all the mexican pepper growing areas. The virus diseases are the most important problems affecting yield and quality of hot and sweet peppers.

Primarily, Tobacco Etch Virus was reported as the causal agent of the virosis. Latter, in 1974, a more virulent Tobaco Etch Virus strain was observed close to the Gulf of Mexico than the other reported in other areas of the country. Cucumber Mosaic Virus was another virus reported in pepper. Since 1974, several researchers have confirmed the presence of these two viruses, multiple infections are not uncommon. The identification methods used by the researchers were: host range, pathogenicity trials, electronic microscopy, viral inclusions, and ELISA. Other less important viruses observed were Tobacco Mosaic Virus and Tobacco Ring Spot Virus.

All studies indicated that the aphids were the main and most effective transmission method of pepper virus diseases; Myzus persicae has been shown to have a close relationship between its population and the virus disease.

A ten years of Myzus persicae research, has shown that this insect increases its population during later September or early October, when wheater conditions are favourable, then, the insect remain in the pepper growing area during all the pepper cycle until March-April. Consequently, the best control method avoiding pepper viruses diseases in the Gulf of Mexico, was the early planting dates during July-August, escaping to high aphid populations. In later pepper plantings, during October-November, a high virus diseases infection level was observed.

Actually, all the planting dates are severely affected, including the months of June and July when aphid populations are the lowest and the virus disease infection levels are high. This suggested that other vectors or different viruses were involved in the problem. During the autumn-winter of 1986-87 the 73% of the pepper growing area was lost due to a virus disease. Other areas from Mexico (Papantla, Veracruz and Tuxtepec, Oaxaca) showed a 60% virus disease infection level; the yield and quality of pepper decreased considerably.

Capsicum Newsletter, 7 (1988), 68-69.

WHITE FLY VIRUS VECTOR

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We found that whitefly was the most prevalent insect with high populations in pepper growing areas.

The first evidence of whitefly virus transmission was shown in 1986 when we put the insects, healty plants, and plants with virus symptoms, together in a mash fine cage. Some days later, healty plants showed virus symptoms. In later trials, we confirmed the whitefly transmission using a controlled environmental chamber. In these trials, first, we produced healty pepper plants in the green house; then we collected whiteflies from the affected pepper areas and put five insects per healty plant; we gave the insects 15, 30 and 60 minutes feeding periods. The results indicated a 4, 13.3 and 40% of virus transmission when the feeding periods were 15, 30 and 60 minuetes, respectively (tab. 1). The fact that, the greater feeding periods, greater transmission percentage, suggests the virus involved could be a persistent or semi-persistent one.

The infected plants were used for graft and mechanical transmission. For that, we took leaves and root tissues and macerated them, in a buffer phosphate 0.1 M, pH 7.1. The extract was inoculated by rubbing. In graft transmission we used infected top sprouts.

This is a preliminary result, but we think this is a new pepper virus, whose vector is the whitefly. Other researchers are working with the virus, they used ELISA method and found that the new virus is different from Cucumber Mosaic Virus, Tobacco Mosaic Virus, Tobacco Etch Virus and Tobacco Ring Spot Virus.

The results indicate that the most efficient transmission technique was by graft, because the mechanical transmission by root was inefficient (tab. 2).

Finally, transmission studies were carried out with whitefly on pepper, tomato and bean infected plants. There was infection in all of them. In pepper a 92%, in tomato 16%, and in bean plants a 50%

The test with non infected whiteflies- in Euphorbia and in tomato plants, collocated, during two days feeding period with viruliferous plants, gave of a 40% of infection in the Euphorbia sp. plants and a 50% in the tomato plants.

Tab. 1 - Feeding periods evaluation with withefly pepper virus vector

Feeding Period	Inoculated Plants	Whiteflies per Plant	% Transmission	Symptoms*
15	225	5	4	M,DF,P,S
30	225	5	13.3	M,DF,P,S
60	60	5	40	M,DF,P,S

*M = Mosaic
DF = Distortion of foliage
P = Proliferation of sprouts
S = Shortening of internodes
NS = No symptoms

Tab. 2 - Transmission trials using inoculum of plants infected by whitefly

Treatment	Inoculated Plants	% Transmission	Symptoms*
Graft	75	91	M,DF,P,S
Mechanical by leaves extract	75	1.3	M,DF,P,S
Mechanical by root extract	75	0	NS

M = Mosaic
DF = Distortion of foliage
P = Proliferation of sprouts
S = Shortening of internodes
NS = No symptoms

Capsicum Newsletter, 7 (1988), 70-79. Invited paper

THE USEFULNESS OF TAXONOMY FOR SOLANACEAE BREEDERS, WITH SPECIAL REFERENCE TO THE GENUS SOLANUM AND TO SOLANUM MELONGENA L. (EGGPLANT).

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Solanaceae is one of the most important plant families as regards to the large number of species it contains (more than 3000) and its great use by man : III species (belonging to 22 genera) of the family are cultivated (Hammer, 1986) for various uses like food, condiment, medicine, drug or ornament (Heiser, 1969).

I. TAXONOMY AT THE LEVEL OF THE SOLANACEAE FAMILY.

The taxonomic treatment of the Solanaceae family began in the XVII th century, and is still in progress (D'Arcy, 1979a). Revisions at almost all taxonomic levels (subfamilies, tribes, genera, subgenera, sections, series, species) continue to be published (D'Arcy 1979b, 1986a, 1987). These frequent revisions have their origin mainly in the discovery of new variability, the use of new classification criteria and the progressive control of the common use of numerous synonyms. These taxonomic revisions lead of course to variations, from one publication to another, of the number of constituents at each taxonomic rank. For example, the number of genera within the family varies from 83 (D'Arcy, 1979a) to 93 (D'Arcy, 1986b), and the number of species from "more than 2000" (Riley, 1983), linearly 3000" (D'Arcy, 1979a) to "some 3500" (D'Arcy, 1986a).

The Solanaceae family is split into three subfamilies (Solanoideae, Cestroideae and Nolanoideae), themselves split into several tribes (D'Arcy, 1979a).

The main classification criteria for all taxonomic ranks are the morphology of several organs of the plant, especially seed, embryo and flower structure, but also fruit, vasculature, branching pattern and so on. Chromosome counts, alkaloid chemistry, crossability studies (D'Arcy, 1979a), flavonoids (Whalen, 1979), izozymes (Rick, 1983), seed proteins (Pearce & Lester, 1979), spermoderm structure (Lester, 1988), hair type (Seithe, 1979), stomates (Bessis & Guyot, 1979), chloroplastic DNA (Olmstead, 1988), are either of more recent use or are restricted to the study of relatively few infrageneric taxa.

II. TAXONOMY AT THE LEVEL OF THE SOLANUM GENUS.

The Solanum genus belongs to the Solanoideae subfamily, tribe Solaneae as do most other cultivated genera (e.g. Capsicu , Cyphom ndra, Lycopersicon, Physali), (Hunziker, 1979). Solanum is the biggest genus in the family

Solanaceae, with between 1000 (D'Arcy, 1988) and 1400 (Nee, 1988) species described under more than 3000 names (Nee, 1988). Persistent use of synonyms further complicates analysis of the literature. This paper attempts to introduce the reader systematically to some of the most important species, especially those allied to Solanum melongen . However, a comprehensive yet succint treatment of the plethora of species produced by the combined fertility of nature and taxonomists is at yet impossible!

2.1. Famous, known and neglected Solanum species

Solanum species are widely used throughout the world. S. tuberosum L. (the Potato) and S. melongena L. (the Eggplant) are the most famous Solanum used as food. But other common edible species do exist. For instance, S. aethiopicum L. Aculeatum, Gilo, Kumba and Shum groups (see Lester & Niakan, 1986 for the synonymous n~mes) and S maciocarpo L., among other species, are widely used as vegetables in tropical Africa (Jaeger & Hepper, 1986) but also in southeastern Asia U.B.P.G.R., 1981) and in some countries of South America O.N.P.A., 1985). S. muricatum Ait., S. quitoense Lam. and S. sessiliflorum Dun., among other species with sweet juicy fruits, are traditionally cultivated in South America (Heiser, 1969, 1985; Anderson, 1979; Riley, 1983). Several other more or less spontaneous minor species are eaten by man in different parts of the world for their fruits, shoots or leaves (Lawrence, 1960; Martin & Pollack, 1979; Peterson, 1979).

The second important use of Solanum species is pharmaceutical: S. viarum Dun. (= S. khasianum Clarke var. chatterjeeanum Sengupta) and S. laciniatum Ait. (Bradley & al., 1979 ; Miller & Davies, 1979 ; Schreiber, 1979 ; Korneva & Esipova, 1983 ; Roddick, 1986) are cultivated, especially in India, Nepal and eastern Europe, for their high solasodine content, a precursor of the hormones used for human birth control.

Several Solanum species are also used in medicine, rituals and divinations in South America (Schultes & Raffauf, 1988), Africa (Jaeger & Hepper, 1986), India (Mehra, 1979 Jain & Borthakur, 1986) and Australia (Peterson, 1979).

Some species are highly poisonous, like S. mammosum L. (Nee, 1979). other have an ornamental interest, for instance S. jasminoides Paxt., S. pseudocapsicu L., S. sisymbrifolium Lam. and S. laciniatum (Bailey, 1947T. Some are troublesome like the' common weed S. nigrum L. because of its resistance to herbicides.

2.2. Taxonomy of Solanum species.

The main distinctive features of the genus have been described by Symon (1985). The basic chromosome number is x=12, but exceptions do exist. It is impossible to present here either a full list of the Solanum species or an exhaustive and satisfying taxonomic arrangement. The prime reason is that such lists or arrangements do not yet exist. We will limit our presentation to the main features of the taxonomic knowledge of the genus Solanum, and of some phylogenetic affinities between its taxonomic ranks.

Solanum genus comprises about 200 tuberous species (D'Arcy, 1986c) and between 800 and 1200 nontuberous species. It has been split into 7 subgenera by D'Arcy(1972).

Subgenus Leptostemonum (Dun.) Bitt.

This is the biggest subgenus, with a number of species estimated f rom “about 450" (Whalen, 1984) or "about 600" (Whalen, 1986) to 307 (Diarcy, 1988). Among these numerous species are S. aethiopicum, S. campanulatum R. Br., S. linneanum Hepper & Jaeger (= S. sodomeum auct. non L.), S. hispidum Pers, S. warcewiczii Weick. ex Lambertye), S. incanum L., S. macrocarpon, S. melongena, S. quitoense, S. sessiliflorum (= S. topioro), S. sisymbrifolium, S. torvum Sw., S. viarum, etc.

The subgenus is recognized morphologically (Whalen, 1984) by attenuate anthers, stellate indumentum and the frequent presence of prickles on vegef-ative parts. Several sex forms are well developed in the subgenus (Symoa, 1979b; Whalen, 1984, 1986): hermaphroditism (hermaphoditic flowers on oa,- plant), andromonoecy (hermaphrodite flowers and also male flowers on one plant) and androdioecy (hermaphrodite flowers and male flowers on separate plants). Most of the species are self compatible (Whalen, 1984).

The taxonomic arrangement of the Leptostemonum subgenus is particularly difficult and submitted to frequent reorganizations. D'Arcy (1972) split it into 22 sections but more recently, Whalen (1984) split it into "about 33 groups" on the basis of morphological similarities and phylogenetic isolation of the species.

The subgenus is represented throughout the tropics and subtropics of the world, with a small extension into temperate regions. Whalen (1984) gave the following world distribution of the subgenus:
- 16 groups in South America (about 180 species),
- 14 groups in Meso and North America and in the Carribean (about 45 species),
- 8 groups in Australasia (about 100 species), - F,, groups in Africa (about 80 species),
- 5 gioLips in southern Asia (about 20 species).

-D’Arcy (1972) placed S. melongena into the section Melongena (= section An.lromonoecum) with S. incanum, S. macrocarpo, S. linneanum and other, species.

Whalen (1984) placed S. melongena in the S. incanum group, which comprises ,i dozen species. This group is centered in east Africa, but some species are found in tropical west Africa, southern Africa, the Middle East and Southern Asia. S. melongena has been domesticated in Southern Asia, but the distribution of its wild ancestor S. incanum, is more African (Lester & The "fairly complete but non exhaustive list" of the species of this group, given by Whalen (1984) is the following: S. aculeastrum cerasiferum Dun., S. incanum, S. marginatum L.f. and S. melongena. Wholen (1984) also included some species probably more distantly related: S. dasphyllum Thon., S. macrocarpon, S. richardii Dun., S. sesilistellatum Bitter and S. linneanum Hepper & Jaeger (= S. xanthocarpum Schrad. & Pendl.) also belongs here.

Subgenus Potatoe (G. Don) D'ARCY

This is again a large subgenus with 226 species, belonging to 9 sections (D'Arcy, 1972; 1988), and represented mainly in South America. The subgenus is characterized by scandent species, pinnate leaves often with interstitial leaflets, lateral pendulous inflorescences and articulation of the pedicels above the base (D'Arcy, 1972). All the species are hermaphrodite, except one case of dioecy; gametophytic self-incompatibility is widespread (Whalen, 1986). Polyploidy is frequent. Most of the species belonging to this subgenus are tuberous.

S. tuberosum and other cultivated tuberous Solanum species belong to this subgenus, but also some non tuberous species, e.g. S. muricatum. Five other non tuberous Solanum species (S. ochranthum Dun., S. juglandifolium Dun., S. ricki Corr., S. lycopersicoides Dun. and S. pennelli Corr.) are closely related to tomatoes (Lycopersicon species) which also may be classified here as Solanum species, subgenus Potatoe section Lycopersicon (Child, 1979a).

Subgenus Solanum.

This is also a large subgenus with 168 species belonging to 11 sections (D'Arcy, 1972; 1988). The center of origin is mainly the New World but the distribution is now worldwide. Main features of the subgenus are stout anthers, simple hairs, no prickles (D'Arcy, 1972) and hermaphroditism or andromonoecy (Symon, 1979b). Polyploidy is frequent in the section Solanum (Black nightshades, S. nigrum complex). S. pseudocapsic belongs to this subgenus.

Subgenus Brevantherum (Seithe) D'Arcy.

Small subgenus with 58 species, belonging to 5 sections (D'Arcy, 1972; 1988), represented mainly in South America. It includes groups with stout anthers, entire leaves, dendritic or stellate hairs. All species are hermaphrodite (Symon, 1979b).

Subgenus Bassovia (Aubl.) Bitt.

Small subgenus with about 20 species split into 3 sections, mainly represented in South America (D'Arcy, 1988).. It includes groups with stout anthers, simple hairs, no spines, pinnate leaves without interstitial leaflets, and in many cases axillary inflorescences and pointed fruits (D'Arcy, 1972). All species are hermaphrodite (Symon, 1979b).

Subgenus Archaesolanum Marzell.

This is a small subgenus, including a dozen species distributed in the South Pacific (Australia, New Guinea). They are almost glabrous, have no stellate hairs and no prickles, have large and variable leaves and succulent fruits with abundant stone cell masses (Symon, 1979a). Few of these characters occur in the other subgenera. All species are

hermaphroditic (Symon, 1979b). The subgenus is unique in Solanum in having a basic chromosome number x = 23 (Symon, 1979a). Spec ies of Archaesolanum subgenus contain high levels of solasodine. S. aviculare Forst. F. and S. laciniatum belong to this subgenus.

Subgenus Lyciosolanum Bitt.

Small subgenus with a sole species (S. guineense L.), recognized on the basis of elongate filaments and local distribution (South Africa) according to D'Arcy (1972); hermaphrodite (Symon, 1979b). This subgenus should be perhaps considered as a section of subgenus Solan (D'Arcy, 1972).

2.3. Taxonomy and evolution studies.

As the variability available in Solanum species gets more accurately described, taxonomists increasingly recognise distinctive features from primitive to more "advanced" states and propose possible evolutionary sequences. For instance, the primary level of organization for branching is furcate sympodia with plurifoliate sympodial units (Danert, 1967 translated by Child, 1979b). From this basic feature, taxa with monochasial sympodia and plurifoliate, trifoliate, difoliate and monofoliate sympodial units, have evolved. Evolutionary tendencies for characters of the stellate haired Solanum have been given by Symon (1979c): for instance geminate phyllotaxy, pinnate leaves, branched tomentum and solitary flowers are respectively more "advanced" characters than are alternate phyllotaxy, simple leaves, simple tomentum and paniculate inflorescences. Polyploidy is considered as a more "advanced" character than is diploidy (Symon, 1979c), andromoncecy than hermaphroditism and self-compatibility than self-incompatibility (Whalen, 1986). Recently a synthetic sequence of the evolution of the genus Solanum has been proposed (Nee, 1988).

2.4. Taxonomy and phylogenetic affinities.

The knowledge of the phylogenetic affinities between Solanum species is essential for those who want to drive forward breeding programs on cultivated species. The crossability between species belonging to distinct subgenera is very improbable. Thus, crossing attempts between such species is meaningless. Inside each subgenus, closely related species often occupy the same continental regions, and intercontinental relationships are exeptional. Such exceptions occur for instance in the subgenus Leptostemonum, which has the largest world distribution (Whalen, 1984).

We will limit here our comments to S. melongena (subgenus Leptostemonum). According to Whalen (1984) species closely related to eggplant must be sought preferentially among the Old World species. The analysis of the literature (Daunay & al., 1988) relative to crossability attempts between eggplant and Solanum species and relative to the search for disease resistances in Solanum species demonstrate that such advice is partially right. out of 19 species used throughout the world in crossability studies with eggplant, only four gave fertile progenies from partially fertile Fl hybrids. All of them are Old World species:

- S. incanum, S. linneanum, and S. macrocarpo (section Melongena sensu D'Arcy, 1972; S. incanum group sensu Whalen, 1984),
- S. aethiopic (section Oliganthes sensu D'Arcy, 1972; S. anguivi group sensu Whalen, 1984).

Fifteen other species when crossed with eggplant, gave partially fertile hybrids or no hybrids at all. They belong to 8 sections (sensu d'Arcy, 1972) or to 7 groups (sensu Whalen, 1984). Six of them have their origin in the Old World (S. campylacanthurn Hochst., S. marginaturn, S. pyracanthos Lam., S. tomentosurn L., S. violaceum Ort. and S. virginianum). Seven of these species are native from South America (S. grandiflorum Ruiz & Pavon, S. hispidum, S. mammosum, S. sisymbrifolium, S. stramonifolium Jacq., L. torvum, S . viarum). Lastly two of these species are native from Australasia (S. campanulatum and S. cinereum R. Br.).

The synopsis of Daunay & al. (1988) demonstrates that Old World origin and classification into the section Melongena (sensu D'Arcy, 1972) or into the S. incanum group (sensu Whalen, 1984) do not guarantee crossability between a Solanum. species and eggplant. Crosses are sometimes successful between eggplant and species belonging to separate sections or groups. To summarize, it is very difficult to predict (with some reasoh able probability of success) the result of a crossing attempt.

Taxonomic research can be helpful for eggplant breeders, in assessing more or less relationships between species, , on a broad basis (geographical origin, morphological similarities, protein analysis, etc.). This can help the breeders to focus their interest on the species particularly related to eggplant, and dispersed through the 100 species native from the Old World and perhaps through the 350 other species, native from America, Africa, southern Asia and Australasia! Only 19 interspecific crosses have been yet attempted; several others need to be rationally investigated! This is the case for instance, of some andromonoecious species from Australia. Symon 0979a; 1988) and Whalen (1984) point out relationships between S. chippendale! Symon, S. diversiflorum F. Muell., S. eburneum Symon, S. melanospermurn F. Muell. and S. phlomoides Benth. and the S. incanum group (sensu Whalen, 1984).

Eggplant breeders are up to now, not so fortunate as plotato breeders who have at their disposal the book of Correll (1962): "The Potato and its wild relatives". But taxonomic research on species of the subgenus Leptostemonum is still in progress and one can hope for the publication, in the future, of the book "Eggplant and its wild relatives"'

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EVALUATION ANr) DOCUMENTATION OF EGGPLANT GEnMPLASM

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Egg plant germplasm accessions are being collected and maintained Pit Agriculturql Research Station, Palur, Tamil Nadu, India. 140 typ9s of egg plant accessions collected both from Indigenous and exotic sources were evaluated and documented from 1984 to 1988. A large number or variation has been obaorved In all the quantitative characters. These accessions were documented into different groups based on the morphological traits, The accessions EP14, EP18, EP21 and EP23 recorded high yield potential and offer scope for furthur selection. EP9, EP17 and EP43 exhibited more number or fruits per plants Cluster bearing of fruits has been observed In the accessions EP59, EP65 and EP75. Based on fruit girth and length, the accessions could be grouped into round fruited,, long frulted and small fruited types.

The germplaem includes S. indicum and S. Khasianum which are resistant to phomoedis blight and other species like S. macrocarpum, S. incanum, S. integrifolium, S.tarvum. S. aethlopicum and S. SisImbrifollum.

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INTERRELATION BETWEEN WATER CONSUMPTION BY EGGPLANTS AND THE QUALITY OF THE PRODUCT OBTAINED

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Perennial data indicate that the highest yield of commercial eggplant product (50-60 tons per) was harvested on plots where the pre-irrigated soil moisture was Wo of least water capacity in 0-30cm. and 0-50 cm. layers. Because of heavy bitterness, fruit obtained'o+ non-irrigated background are not suitable to be used for food. A high background of water supply contribute@ -to -the decrease of the nitrate content - 113 mg./kg. of fresh matter on a non-irrigated background and 60-90 mg./kg. - on irrIgated areas.

One of the major requirements to eggplants as raw material for processing is the absence of bitter taste, which is induced by -the presence of solanine and some polyphenols in the fruit. Besides, the degree of maturity of the fruit, -the level of the solanine content in eggplant fruit is affected by the provision of plants with water. Thus, on growing the variety "Dnestrovetz" without irrigation, the solanine con-tent in fruit of technical ripeness comprised 27 mgl/o,while in a background of high water delivery - it was 7.7 mg%. In this case, the solanine content in different parts of the fruit varied by 10-20 times. Various levels of mineral nutrition did not affect significantly the solanine content in fruit.

For the purpose of carrying out breeding work for decreasing' the solanine content in eggplant fruit it is suggested for the estimation to take fruit of pre-biological or biological ripeness with the indication as to solanine *in* the flesh of the seed;vessel or *in* seed - where its content is at maximum. The use of any other part of tile fruit for testing sharply decreases the effectiveness of screening for this trait.

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SINK SOURCE RELATIONSHIPS OF HIGH AND LOW YIELDING BRINJAL CULTIVARS

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Physiologically yield is a reflection of the assimilate supply(the source) to the fruit and the potential of the fruit to Rccomodate the assimilate (the sink). The growth and yield of a higher yielding brinjal I, cultivar' Arka Havneet' were compared with a poor yielding one "Annamalaill. Both'Arka Navneet I and I Anna.malailreached the maximum leaf area of 51.66dm 2 and 46.14 dm 2 by 12 weeks after planting. Table i present the data on growth parametors. The leaf area ratio# the ratio of i-elative increments of leaf area and dry weights of the plant was maximum in'Arka 111avneet' by 30 days of plantinL., after which a decrease w(a.9 observed. Net assimilation rate and relative growth rates were high during initial growth stages and decreased as the season progressed. 'Arka llavneet'had the maximum NAR and RGR; but the cultivar differences were not significant. Significant differences for GGR were observed between the two cultivars. The specific leaf weight wns significantly higher in the high yielding cultivar from -the beginning of vegetative growth. The biological yield end, the harvest index in'Arka Navneet'(222 P'nd 78%) was nignificantly higher than infi Annamalai' (137 g and 65%). The fruit yield of ‘Arka Navneet’ (1.8 kg per plant) was double that of ‘Annamalai’ (0-95 kg per plant). It appears that a high yielding variety is characterised by a higher CGR, SLW, LAR and harvest index.

Table 1. Growth Parameters of the two brinjal varieties at different stages of growth.

	Days after planting								
	16-30	31-45	45-60	61-75	76-90	91-105	106-120	121-135	136-150
1.Leaf area ratio (dm2. g^{-1})									
Arka Navneet	3.68	1.81	1.17	0.98	0.79	0.56	0.27	0.18	0.12
Annamalai	2.76	1.40	0.92	0.72	0.54	0.37	0.24	0.10	0.10
CD 5%	Variety	=	.119	Time	Interval =	.17	Interaction	=	.25
2. Net assimilation rate (mg.dm2.date-1)									
Arka Navneet	42	72	92	114	102	79	58	-36	-26
Annamalai	28	57	74	121	88	65	48	-18	-47
CD 5%	Variety	=	N.S.	Time	Interval	= .25	Interaction	=	.35
3. Relative growth rate (gg^{-1}. day-1)									
Arka Navneet	0.161	0.156	0.092	0.105	0.087	0.034	0.025	-0.004	-0.005
Annamalai	0.127	0.126	0.083	0.99	0.073	0.029	0.020	-0.004	-0.004
CD 5%	Variety	=	N.S.	Time	Interval	= .009	Interaction	=	.013
4. Crop growth rate (g.ground area-1 day-1)									
Arka Navneet	0.038	0.236	0.826	4.25	14.47	11.12	13.62	-2.54	-2.94
Annamalai	0.013	0.184	0.524	2.78	8.09	6.79	8.61	-1.25	-1.69
CD 5%	Variety	=	.97	Time	Interval	= 2.02	Interaction	=	2.84
5. Specific leaf wt.(g.dm-2)									
Arka Navneet	0.253	0.466	0.596	0.620	0.731	0.842	0.942	0.955	0.919
Annamalai	0.128	0.397	0.543	0.607	0.657	0.768	0.837	0.826	0.860
CD 5%	Variety	=	.03	Time	Interval	= .06	Interaction	= .08	

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CORRELATION STUDIES IN Solanum, melongena L.

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For designing an effective plant brooding programme adequate knowledge about the magnitude and direction of association between yield and its component traits are essential particularly in different segregating generation of crosses. In the present study, the correlation coefficients between yield/plant yield and its component traits and the Inter correlation coefficients among the component traits were worked out in F2 generation of Brinjal cross EP47 x IEP220 yield/plant to positively correlated with number of fruits per plant, number of branchest rruit length and plant height (Table l). Days to first ftowering exhibited negative correlation with yield per plant. Number of fruits per plant recorded negative correlation with fruit length and fruit girth. Plant height recorded positive correlation with number of branches. Number of branches and fruit number are directly correlated. Hence for getting significant result in yield improvementg number of fruits per plant and number of branches per plant may be rekoned as first order component and considered as selection criteria In yield improvement programmes.

Table 1.
Correlation coeficient in F2 generation of Brinijal cross EP47 x EP22.

Character	Plant height	Number of branches	Number of fruits	Fruit girth	Fruit length	Yield/plant
Days to First flowering	0.0938	-0.1804	-0.2306	0.0407	0.0508	-0.1978
Plant height	-	0.2705	-0.0133	-0.0320	0.0404	0.2701
Number of branches	-	-	0.5102	0.0302	-0.0294	0.4023
Number of fruits	-	-	-	-0.2230	-0.1422	0.9406
Fruit girth	-	-	-	-	0.0344	0.1823
Fruit length	-	-	-	-	-	0.3924

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HERITABILITY ESTIMATES IN SEGREGATING GENERATIONS OF' EGG PLANT

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Heritability and gonsti a advance for six traits in F2 populations of three crosses of egg plant were studied following the methods suggested by Johnson et al (1955). High heritability estimates are helpful in the selection of superior genotypes on the basis of phenotypic performance of quantitative characters. Heritability estimates were found to be Invariably moderate to high for all the economic characters In the three ebosses studied In F2 goneration. Days to first flowering registered moderate heritability with low genetic advance indicating the high Influence of environment over this character. Yield of fruits per plant recorded high heritability with high genetic advance and number of fruits per plant recorded moderate heritability with high genetic advance suggesting involvement of additive gone action. Yield increase could be achieved through the selections for number of fruits par plent In the early generation itself (Table, 1).

Literature

Johnson,, H.W. Robinson, H.F. and Comstock, R.E. 1955, Estimates of genetic and environmental variability in soybean Agron J., 471314-318.

Table 1.
HERITABILITY AND GENETIC ADVANCE AS PERCENT OF MEAN IN EGG PLANT CROSSES.

Character	Crosses *	Heritability percent	Genetic advance as percentage of mean.
Plant height	1	83086	29.26
	2	81.86	26.08
	3	82.82	33.07
Days to first flowering	1	63.41	11.72
	2	78.34	15.27
	3	57.69	9.59
Number of fruits per plant	1	41.33	48.41
	2	60.66	48.39
	3	58.14	44.51
Fruit length	1	77.61	45.44
	2	80.92	28.59
	3	81.71	32.07
Fruit Girth	1	78.85	2884
	2	75.99	40.91
	3	79.89	33.37
Yield per plant	1	68.29	80.43
	2	80.59	52.47
	3	71.11	44.67

*1. Ep 120 x EP107, 2. EP 181 x EP47 x EP 120

Capsicum Newsletter, 7 (1988), 88-89.

STUDY OF RECURRENT AND REGULAR MUTANTS IN 36janum melinagia',L.

E. Vadivel and J.R. Kannan Bapu.

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The seeds of egg plant cv. ‘Annamalai’ were irradiated with gamma rays at 2,5, 15 and 25 Kr. The seeds of M3 progenies were reirradiated to got recurrent M 3 progenies. The regular M4 progenies and recurrent M3 Progenies Wave raised simultaneously and compared.

The Performance of both regular M4 and recurrent M3 generation was given In Table 1. In general, the variability is high in RM 3 progenies for plant height, fruit length and yield per plant when compared the M4 progenies, Plant height Increased while fruit length and girth decreased in RM3 than the M4 generation. The number of fruits and yield per plant have been negatively correlated with dose of gamma rays In regular M4 generation and positively correlated wl th gamma rays doses in RM3 generation.

Eventhough the recurrent mutants recorded high yield than the regular mutation progenies, it had deleterious effect on fruit length and fruit girth.

Table 1.

Performance of M4 and Recurrent M3 (RM3) mutants in Brinjal cv. Annamalai.

Character	Dose	Mean		Variability	
		M4	RM3	M4	RM3
Days to first	Control	42.2	-	14.46	-
Floweing	2.5 KR	43.73	41.67	46.07	16.04
	15 KR	45.07	41.27	37.78	30.64
	25 KR	48.40	44.00	30.82	22.28
Height (cm)	Control	95.93	-	74.35	-
	2.5 KR	41.13	98.80	134.98	172.31
	15 KR	94.53.	106.93	191.12	337.35
	25 KR	98.06	109.30	236.21	329.38
Fruit length	Control	9.19	-	0.58	-
(cm)	2.5 KR	7.40	7.14	1.53	1.62
	15 KR	7.92	6.17	1.51	1.58
	25 KR	8.86	6.51	2.74	3.24
Fruit Girth	Control	5.93	-	0.40	-
(cm)	2.5 KR	6.05	4.13	1.78	0.40
	15 KR	5.17	3.26	0.98	1.35
	25 KR	3.87	3.41	2.05	0.92
Number of	Control	32.33	-	17.28	-
Fruits	2.5 KR	34.87	22.93	34.70	25.70
	15 KR	22.30	18.93	31.84	25.83
	25 KR	20.33	29.33	25.27	31.69
Yield per	Control	1.22	-	0.03	-
Plant (kg)	2.5 KR	1.32	1.07	0.04	0.05
	15 KR	1.20	1.20	0.05	0.09
	25 KR	1.00	1.32	0.06	0.09

Capsicum Newsletter, 7 (1988), 90-91.

SOIL APPLICATION OF FUNGICIDE5 AGA1NsT WILT OF EGGPLANT

Ko Se Kapoor and S. Re ShMrMa I.A.R.I., R*gional Stationg Katraing Kullu Valleys, H.P.-175.129

Soil sickness is one of the most important limiting factor for eggplant (4ojaggm,gglongena) seed production in Northern part of India. The principal cause is wilt caused by Fusarjum-Solanj. The characteristic symptoms are stunting of plants and withering of immature fruits, yellowing of leavost drooping of opical portion.and ultimately drying of whole plant. Affected roots exhibit soft and watery appearencee

In the present studyg eleven fungicides were tried against wilt disease in a replicated sick field trial. Eggplant seedlings var. Pusa Purple Long# raised in sterlizod soil# were transplanted after dipping the roots for 20 min In the test solution of fungicides. One hundred oil solution of respective fungicidoe was applied four times around the vicinity of root zone of each plant at 15 days interval during the growing period. Control received water treatment only.

It is axiomatic from the table that all the fungicides were better than control. The mortality rate was least (2.,08) in daconil-2787* The next best fungicides were bavistLn and rovral. All the fungicides except calizin and brassicol produced significantly more healthy fruits than control. The differences in fresh fruit weight were non significant among different treatments except calixin and brassicol which were found to be toxic, Considering different parameters daconil-2787 was found superior over other fungicides in controlling wilt of eggplant.

Table: Efficacy of different fungicides against Fusarium wilt of eggplant.

Fungicide	Conc.(%)	Average number of wilted plants	Average number of healthy fruits	Average number of diseased fruits	Average fresh fruit weight (kg)	Average seed weight (gm)
Bavistin	0.2	4.17	65	22	11.317	238
Blitox	0.3	14.58	106	21	18.683	242
Brassicol	0.3	16.67	40	21	6.817	63
Calixin	0.1	16.67	40	38	3.667	48
Captan	0.3	6.25	104	30	17.817	125
Ceresean Wet	0.2	10.42	102	32	17.517	245
Cuman L	0.3	6.25	105	22	17.003	207
Dacconil-2787	0.2	2.08	115	19	19.083	268
Difoltan-80	0.2	6.25	103	32	18.167	220
Rovral	0.2	4.17	104	26	11.833	128
Zineb	0.3	18.75	111	29	18.217	202
Control	-	37.50	90	43	15.33	167
C.D. at 5%		9.6875	43.5321	N.S.	6.53499	10.1223
C.D. at 1%		13.1976	59.3046		8.90274	13.7898

Capsicum Newsletter, 7 (1988), 92.

SCLEROTINIA SCLERoTIoRUM - A THREAT To SEED PFIDDUCTION OF EGGRLANT

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During September 1987, typical wilting of seed crop of eggplant variety Pusa Purple Cluster was observed at the above IrBtitute's faM7 situated at an altitude of 1676 m above sea. Level more than 40% plants in full bearing showed severe wilting and dried up within a monthts period. The initial symptoms were circular to elongate water soaked lesions closer to the inflorescence followed by watery soft rot. In the advance stages creamy coloured compact sclerntial initials as well as matured black sclerotia of varying sizes were evident on above grnund parts. The invaded stem and branches gave bleached appearence and fruits exhibited prbgressing sign of discoloration from calyx erd which, boweverg remained attached to the wilted plant, on an average each affected fruit was found to contain 3,400 g of fresh sclerotia which were as small as mustard seed or as large as 3.0 x 1.5 am, Roots did not show any sign of i nfec t io no

The characteristic signs and symptoms on the host and description of the pathogen given by Mordue and Holliday(1976) confirmed the identity of the fungus as Sclerotinia sclerotiorum .

The weigh of 1000 seed extracted from diseased and healthy fruits was ?00 and 3200 mg with their respective germination 0 and 100% under optimum conditions. Blotter method as recommended by International Seed Testing Association (1966) failed to establish the internal or external Seed-borne nature in affected eggplant seeds.

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Capsicum Newsletter, 7 (1988), 93-94.

A VIRU8 DISEASE OF EGGPLANT IN TURKEY: EGGPLANT MOTTLED DWARF VIRUS

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Eggplant is one of the most popular and profitable vegetable crops extensively grown in many regions of Turkey over an area of about 35000 ha. In recent years,the cultivation of eggplant in both field and glass-or plastic houses has been considerably increased.However,in the course of the past two growing seasons it was observed that a virus disease had become a serious problem in the production areas of eggplant over especially Southern and Western parts of Turkey.Affected plants showed chlorotic mottling,vein clearing and deformation on leaves followed by the reduction in leaf size.At the further stage,it was seen that foliar symptoms were accompanied by mild or severe stunting and poor fruit set.

To find out the host range of the virus involved mechanical transmission trials were performed by rubbing leaf extracts from diseased eggplants on celite-dusted leaves of certain indicator plants.The virus in question was maintained in N. tabacum L. "White Burley" and this species was also used as assay plants for determining the physical properties of the virus.The data from these studies are summarized in Table 1.

When the present virus from eggplants was tested with the antiserum to eggplant mottled dwarf virus (DIDV),it was observed a positive relationship.Although it has been still continued the works as to the examinations of the virus in the electron microscope,the preliminary results obtained showed that bullet-shaped rhabdovirus-Like particles could be present in foliar tissue of infected plants. Symptoms on the indicator plants,physical properties and first examinations in the electron microscope corresponded to those reported for EMDV (1,2,3,4).This identification was further confirmed by serological assays.Thus,the serious virus disease on eggplants can be attributed to EMDV which has been recorded to occur on eggplants in Italy and Tunisia (1,3).

Table 1. Symptoms caused by the virus from eggplants on certain indicator plants and the physical properties of the virus involved.

Indicator Plants	Symptoms
Chenopodium quinoa Willd	Yellowing
C.amaranticolor Coste and Reyn.	Yellowing
Datura stramonium L.	Chlorotic spots
Gomphrena globosa L.	Chlorotic spots
Lycopersicon esculentum Mill.	Yellow mottling, leaf deformation
Nicandra physaloides (L.) Gaern.	Yellow spots
Nicotiana debneyi Domin.	Yellow mottling
N. glutinosa L.	Yellow mottling, vein-clearing
N. rustica L.	Yellow mottling, Yellowing
N. tabacum L. "Maden"	Yellow mottling, Yellowing
N. tabacum L. "Xanthi"	Yellow mottling, stunting
N. tabacum L. "White Burley"	Yellow spots, vein-clearing, Yellowing
Solanum melongena L.	Yellow mottling, leaf deformation, vein-clearing, stunting.
DEP	1/1000 – 1/`10000
TIP	55 – 60°C
LIV	2 – 4 days

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The Proceedings of the VIth Eucarpia Meeting on ‘Genetics and Breeding on Capsicum and Eggplant' held in Zaragoza, Spain in 1986 are still available.

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