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International Cooperation

Outreach Project Central America

On 4 July 1980 the Swiss Development Cooperation (SDC) signed an agreement with CIAT whereby SDC would finance an international technical cooperation program carried out by CIAT in collaboration with national research institutions for the improvement of bean production in the Central American and Caribbean region The initial phase of the project was stipulated to be from 1 September 1980 to 31 December 1983

Summary of Project Achievements in 1981

Project activities have advanced rapidly on two fronts First based on crosses made at CIAT for the specific use in Central America and the Caribbean a majority of countries collaborating in the project have selected and tested their own superior lines In many cases these lines have already undergone farm-level testing and have officially been released as new varieties At the same time the project has been successful in identifying sources of resistance to several pests and diseases that are of regional importance These sources are now being utilized in CIAT s bean improvement program so as to assure yet better improved bean materials for the future

Second the project has been able to arrange relevant training experiences for a relatively large number of regional bean workers This specialized training already has contributed to the strengthening of national bean programs and in no small measure has made possible a decentralization of the bean improvement process whereby national programs now are capable of selecting their own materials from segregating populations thus assuring that the selections are highly adapted to local conditions

Finally during this reporting period the project has been able to demonstrate that based on its catalytic activities in bean development in the region formerly isolated efforts in support of bean development now are amalgamated into a region-wide effort that allows for the free interchange of bean technology

Research Activities

Pathology Similar to the overall orientation of CIAT s Bean Program this regional project stresses the development of bean varieties that are tolerant or resistant to prevalent disease and insect pests In the normal case the project in its regional improvement efforts makes heavy use of sources of resistance that are already available at CIAT However in the case of two regionally very important production constraints--web blight (Thanatephorus cucumeris)

and bean golden mosaic virus (BGMV)--the project largely depends on its own efforts for the development of disease-resistant materials as the pressure from these two diseases is not sufficient outside the Central American region Also because a third disease common bacterial blight (Xanthomonas phaseoli) is increasingly assuming importance in the region the project recently has had to increase its effort to develop resistance to this disease

In 1981 the project planted the Preliminary Trials (EP) in Costa Rica and Guatemala in an effort to identify promising materials in terms of tolerance to web blight BGMV angular leaf spot rust anthracnose and ascochyta For the evaluation of the materials to web blight the EP was planted in three different ecosystems to expose the materials to as varied a complex of biotypes of the causal agent of web blight as possible A series of materials has already been identified for acceptable levels of tolerance to web blight once this tolerance has been incorporated into commercial varieties much of the highly damaging effect of web blight can be counteracted especially if tolerant varieties are grown under management conditions that include integrated web blight control measures

To evaluate web blight-tolerant materials throughout the region the first International Web Blight Nursery (VIM) was assembled in 1981 this nursery was distributed to and planted in Costa Rica El Salvador Guatemala Nicaragua and Panama

Entomology In entomology the principal objective of the project is to develop commercially acceptable bean varieties with resistance to the bean pod weevil (Apion godmani) In 1981 the first international Apion nursery (VIA) was established This nursery was planted in Guatemala Honduras and Mexico Preliminary data already available from the nurseries point to a high correlation of observed resistances between the three sites Efforts are now underway to transfer already available sources of Apion resistance into commercially acceptable cultivars and to combine Apion resistance with resistance to BGMV

Bean breeding

Bean golden mosaic virus All nonblack materials of the 1981 EP nursery were evaluated for resistance to BGMV in the Monjas site (Guatemala) On a rating scale of 1 to 9 (1 = immune 9 = susceptible) the three check varieties were rated as follows Tamazulapa (8-9) Quetzal (7-8) D145 (6-7) One of the EP entries A 174 was found to be clearly superior to all check varieties with a rating of 6 5 this line also was found to have a good reproductive adaptability At the same time various EP entries--most of which have medium to large grain size--were observed to yield well despite the heavy BGMV symptoms present in the plants Among small-seeded materials line BAT 1215 (shiny red color) and BAT 1257 (opaque white color) showed promising BGMV resistance and have been entered as parental material in the ongoing BGMV-breeding program Among black-seeded materials some 70 lines in the EP nursery planted at Monjas (Guatemala) were found to show higher level of resistance to BGMV than the check varieties

In the meantime one of the collaborators in the project the national program in El Salvador has identified various promising BGMV-resistant varieties in the BGMV nursery As most of these lines have brown seed coat colors the BGMV-resistance factors in these materials are now being transferred into commercially acceptable varieties

By the end of 1981 the BGMV breeding program had the following materials in evaluation (a) approximately 280 individual selections in F_2 to F_6 generation (b) five highly promising red-seeded materials obtained in Guatemala and (c) 80 individual selections from the bean-improvement program at CIAT

Apion godmani Based on the Apion nurseries planted in Honduras the following advances were registered

1 Earlier reported Apion resistance in the following materials was reconfirmed Mexico 1290 (G 11506) Line 17 (G 11496) Amarillo 154 (G 3982) and Negro 150 (G 5 67)
2 The highest levels of resistance were observed for APN 42 APN 18 BAT 947 and selected materials derived from the El Salvadorian Line 17 (bright red seed color) APN 18 was observed to also have moderate resistance to common bacterial blight These materials have already entered breeding programs designed to transfer their Apion resistance into commercially acceptable varieties
3 A total of 36 black-seeded materials with promising Apion resistance has been identified and advanced to the breeding program

Common bacterial blight Due to the increased incidence of common bacterial blight efforts to develop resistant materials have been stepped up A series of selected lines organized by grain color and levels of resistance to Xanthomoras phaseoli--the causal agent of common bacterial blight--was distributed throughout the region for screening for bacterial blight and other factors The resulting promising lines were crossed at CIAT with commercially acceptable varieties progenies of these crosses were then handed over to collaborating national institutions for local evaluation and further selection Countries that have received such material include Costa Rica (black-seeded materials) El Salvador (red- and black-seeded materials) Guatemala (red- and black-seeded materials) Honduras (red-seeded materials) and Nicaragua (red- and black-seeded materials)

Technology Transfer

From CIAT to National Programs Throughout the year project staff continued its efforts to keep open and reinforce the lines of communication between CIAT and collaborating countries Communication exchanges were in the form of mutual visits participation in training internships at CIAT and a high level of collaboration in the distribution and testing of germplasm For the first semester planting

season 19 sets of the International Bean Yield and Adaptation Nursery (IBYAN) were distributed for the second semester planting this number increased to 30

Of the climbing bean version of the international bean yield and adaptation nursery (VIRAF) a total of 16 sets were distributed and planted In addition specific nurseries were distributed as follows three sets of the anthracnose nursery three sets of the Apion nursery and three sets of the rust nursery Finally a total of 14 sets of the CIAT Bean Program s Preliminary Trials were distributed and planted in the region for screening to regionally important pests and diseases

Collaboration with participating countries in the region through the exchange of nurseries is of key importance to bean improvement in the region National programs increasingly have the capacity to steer experimental materials through the various selection phases that are required to produce superior varieties with a high degree of local adaptation thus the nurseries assume increasing importance as the principal vehicle to provide national programs with genetically promising materials

Among national programs in the region

Nurseries Throughout the year the project assisted national programs in the further development of national yield nurseries (known as the Viveros Nacionales de Rendimiento VINAR) In these nurseries the performance of new promising germplasm is evaluated against the performance of commercial varieties

A new regionwide nursery became operational during 1981 In this nursery advanced lines and new varieties produced by national programs are tested throughout the region The nursery has been named VICAR (for Vivero Centroamericano de Rendimiento) and is subdivided into black and red materials In the future the nursery will operate under the auspices of the Programa Cooperativo Centroamericano para el Mejoramiento de Cultivos Alimenticios Present arrangements call for the Instituto de Nutricion de Centro America y Panama (INCAP) to provide analytical services to determine such factors as protein content amino acid composition and cooking time of the materials included in the VICARs

In 1981 a total of 25 sets of the VICAR were planted in Costa Rica the Dominican Republic El Salvador Guatemala Honduras Mexico Nicaragua and Panama

Agronomy In 1981 on-farm evaluation tests of promising materials obtained through VINAR and VICAR were established in Costa Rica El Salv dor Guatemala Honduras and Nicaragua Some selected results from these trials follow

In Costa Rica on-farm trials were established in collaboration with the Ministerio de Agricultura y Ganaderia (MAG) and the Consejo Nacional de Produc on (CNP) r addition to evaluating new material

these trials served for the on-farm testing of herbicide and fertilizer recommendations In these trials lines BAT 202 and Mexico-80 outyielded the local varieties by 68 and 55% respectively

In El Salvador in collaboration with CENTA the VINAR nursery was planted in seven different sites Among the red materials lines MCS-97-R Acacias 10 and DOR-164 all outyielded the local varieties (these lines yielded an average of 1374 kg/ha 1276 kg/ha and 1208 kg/ha respectively) Among black materials line BAT 58 produced an average of 1511 kg/ha outyielding the local varieties by 38%

In San Jerónimo and Salama (Guatemala) five on-farm trials were established to further evaluate the improved varieties ICTA-Jutiapan and ICTA-Tamazulapa and the promising lines 80-11 and D-145 The results are shown in Table 1 In San Miguel (Baja Veracruz Guatemala) ICTA-Quetzal an improved variety with tolerance to bean golden mosaic virus yielded 2293 kg/ha or 32% more than the best local variety

Varietal Release

One of the most exciting developments registered by the project to date is the release of new bean varieties which have been made possible through the project In 1981 a total of four new varieties were released by collaborating countries as follows (1) Costa Rica released BAT 304 under the name Brunca (2) El Salvador released BAT 58 as Tazumal' (3) Honduras named line BAT 5678 Copan and (4) Nicaragua released line A 40 as Revolucion 81

Table 1 Results of on-farm trials in five sites in Guatemala 1981

Variety	Sites of on-farm trials					Average	Amount above check (%)
	Los Jocotes	Pueblo Nuevo	San Juan	T Grande	San Miguel		
ICTA-Tamazulapa	3036	1555	1428	1272	850	1628	75
ICTA-80-11	2887	1460	--[a]	1124	681	1538	66
ICTA D-145	2750	--	844	--	857	1483	60
ICTA Jutiapan	2628	1705	902	812	675	1344	45
Local check	2001	1095	629	746	168	927	

a -- = not tested

Seed Production

With the increasing availability of improved bean lines with clear advantages over traditional varieties and with the increased capacity of national institutions in the region to effectively get these new varieties to the production level the project s activities in providing assistance to the production of basic and certified seed has taken on high priority The seed production status as of the end of 1981 was as in Table 2

Training

A principal component of the project is to develop through training the manpower base in support of bean research and development in the region Training takes on two forms CIAT-based postgraduate internships that allow the individual participants to specialize in given aspects of bean research and scholarships for postgraduate studies that lead to a master s degree whereby the thesis portion is carried out under the supervision of project staff of the CIAT Bean Program

In 1981 two candidates for M S scholarships were identified and initiated their studies Ing Bernardo Mora from the Ministerio de Agricultura y Ganaderia (MAG) in Costa Rica and Ing Agr Samuel

Table 2 Seed production status in the Bean Project s area of influence (as of end of 1981)

Country	Variety	Seed (t)
Costa Rica	Talamanca	50
	ICA Pijao	20
	Porrillo Sintetico	3
	Mexico 80	11
Cuba	ICA Pijao	12 000
Guatemala	ICTA-Quetzal	15
	ICTA Jutiapan	12
	ICTA Tamazulapa	7
	ICTA Suchitan	27
Honduras	Acacia 4	23
Nicaragua	Revolucion 79	70
	Revolucion 81	10

Acquajay from the Instituto de Ciencia y Tecnología Agrícolas (ICTA) in Guatemala Both candidates pursue their academic studies at the Universidad Federal de Vicosa in Vicosa Brazil

In terms of postgraduate interns project personnel identified and sent a total of seven professionals from the region to CIAT for training internships where they spent training periods from 2 to 6 months each These candidates came from Costa Rica Cuba the Dominican Republic Guatemala Honduras Nicaragua and Panama

Project personnel also provided inputs in the organization and conduct of in-country bean research and production courses in Cuba (15-27 February) Nicaragua (9-20 March) and Guatemala (21-30 October)

Other Activities

At the request of Nicaragua project personnel provided direct and significant input in the preparation of a national project for coordinated bean research and bean seed production and in the preparation of a second project for training in bean research production Similar assistance in the development of projects was provided to the Dominican Republic and to Honduras in the case of Honduras the bean research and development project under consideration was to be presented by Honduras to the Swiss Development Cooperation Finally in response to a request by the Instituto de Investigaciones Agropecuarias de Panama (IDIAP) in Panama project staff actively participated in the development of plans for a national research effort in support of legumes and rice

Future Plans

The project will continue and expand the delivery to the Central American region of early-generation bean materials which will allow for stepped-up activities in the selection of materials that are adapted to local agronomic and consumer requirements As the project s efforts tc assist in the strengthening of national bean programs increasingly bear fruit in terms of improved regional and national capacity for bean research and development more and more of the varietal improvement activities can be shifted to the region and participating countries

At this stage of development a need is felt for increased attention to the communication links between the various national efforts in the region so as to allow for ready horizontal technology transfer as well as for the building up of a regionwide momentum in support of bean production To this end the project will increasingly emphasize the organization of field workshops and other events that allow for direct interpersonal contacts among bean workers in the region

At the same time now that relatively large numbers of highly promising materials are already available and continue to become

available in ever larger numbers the project will need to pay increased attention to farm-level evaluation of such materials and will need to work on the expansion of the capacity for seed production These two factors will play a key role in hastening the process by which improved materials will reach the production level

The realization of some of these initiatives here go beyond the items included in the present project Hence CIAT is taking the liberty of further documenting and supporting selected actions that are proposed to be undertaken parallel to the present project and to submit these actions to the SDC in the form of a proposal for the expansion of the project

Outreach Project Peru

The Swiss SDC-funded outreach project in Peru composed of one agronomist-breeder entered its third year of operation The project seeks to integrate Peruvian bean research with CIAT breeding activities

Bean production in Peru is concentrated in the irrigated coastal plains with bush beans while the Peruvian highlands form an important bean-production zone for climbing beans Traditionally requirements for adaptation to the coastal plains cannot be met at the CIAT testing sites and a decentralized breeding effort in the Peruvian coast is needed

In the Peruvian north coast new improved lines are being multiplied Two lines Bayo Florida and Vista Blanco (VF 19) have extensively been tested

Lines identified in the CIAT IBYAN trials and of special promise include Pirata 2 and Nep 2 and are currently in demonstration trials More recent promising entries include BAT 1061 BAT 83 BAT 339 and Mich 78-03-27 All these lines could replace the current commercial variety Muy Finca

In the central coastal region several lines are in basic seed production They include the bayo large-seeded types and canario large-seeded types--UNA-Bayo Promesa 2 and Lima 1--and the rust resistant canarios--Nucleo 4 and Linea 11 After 2 years of shown superiority in regional trials these lines will be named and released as new varieties

For the summer plantings the small black-seeded variety Porrillo Sintetico will be replaced by BAT 271 and BAT 1057 Line BAT 304 is outstanding for its early maturity and high yield

The EP has been planted and nurseries of early segregating populations of crosses made in CIAT have been established The parents of these populations involved Peruvian-adapted lines and sources of plant architecture and disease resistance

In the Peruvian highlands bean research concentrates on the development of disease-resistant climbing beans for association with maize Bush beans are also studied however In the October planting a regional trial involving 25 lines was planted in 12 locations One line G 2728 is especially promising and after 2 years of testing has been released as Gloriabamba

A bean-production course on the newly developed bean lines was organized and 27 Peruvian agronomists participated

Collaborative Research

BCMV and Anthracnose Resistance Project with the Institute for Horticultural Plant Breeding (IVT)

The collaborative project with IVT tries to combine recessive gene resistance with dominant I gene resistance to BCMV in tropical adapted genotypes This will provide protection to necrosis-inducing BCMV genes present in some bean-production areas

Incorporation of BCMV-resistant genes into CIAT breeding lines
Six F_3B_1 lines of the backcross-program CIAT progenitors x (F_3 IVT 7233 x IVT 7214) with stock numbers 80328 80337 80338 80385 and 80415 were sent to CIAT in 1980 for backcrossing The backcrosses were made with seven CIAT breeding lines namely BAT 93 448 561 1061 1155 and 1235 and ICA-L23 Seed of 20 F_2 families of this first backcross was received from CIAT in February Ten of the F_2 families were tested with BCMV-strain mixture NL3 + 4 + 5 for selection of resistant plants The choice of the families was according to CIAT priority data as it was too laborious to use all families for testing and selection The segregations in the 10 F_2 families were as shown in Table 3

F_2 families 1 2 3 4 7 8 and 9 reasonably fit a 45 3 16 ratio Numbers 5 6 and 10 had considerably fewer resistant plants than the 16/64 part but parents 80385 and 80415 were not completely homozygous for all four genes bc-u bc-2^2 bc-3 and I as was assessed after the backcrosses had been made

The resistant plants selected in F_2 very likely had gene bc-3 giving complete resistance to BCMV and BYMV, and gene I and some of them also had one or both of the genes bc-2^2 and bc-u To detect the gene combination bc-u bc-2^2 bc-3 I gene bc-3 had to be ruled out This was done by making test crosses with Great Northern 31 a variety carrying genes bc-u and bc-2^2 and then testing the F_1 of the test crosses with strain mixture NL3 + 4 + 5 More than 1800 test-crosses were made to have enough seeds for testing the F_1 The screening results of the F_1 of the test-crosses were as shown in Table 4

One to four F_2 plants most likely homozygously carrying the four desired resistance genes could be indicated in nine families The F_2

Table 3 Segregation of 10 F_2 families for BCMV resistance after inoculation with BCMV NL3+4+5

	F_2 family	Total plants (no)	Reaction (no plants)			Plants selected for test crosses (no)
			sn (systemic necrosis)	pl (pin point lesions)	r (resistant no symptoms)	
1	MC7208 F_2 BAT93 x 80337	234	171	6	57	40
2	MC7212 F_2 BAT448 x 80377	263	178	10	75	40
3	MC7214 F_2 BAT561 x 80337	279	199	8	72	40
4	MC7218 F_2 BAT1061 x 80377	263	209	11	43	40
5	MC7219 F_2 BAT1061 x 80415	460	397	21	42[a]	42
6	MC7221 F_2 BAT1155 x 80385	517	477	27	13[a]	13
7	MC7222 F_2 BAT1155 x 80377	171	126	8	37	37
8	MC7223 F_2 BAT1235 x 80377	243	184	9	50	48
9	MC7226 F_2 ICA L23 x 80338	193	156	6	31	27
10	MC7227 F_2 ICA L23 x 80385	349	285	31	33[a]	27
a	deviating segregation					
	1 + 2 + 3 + 4 + 7 + 8 + 9	1646	1223	58	365	
	Expected according to ratio 45 3 16		1157	77	412	

Table 4 Screening results of testing presence of bc 2^2 and bc u according to reaction F_1 test cross to BCMV NL3+4+5

F_2 family		Resistant plants test crossed (bc 3 and I homozygously present) (no)	Resistant plants (no)		
			bc 2^2 and bc u not homozygously present	bc 2^2 bc 2^2 present	bc 2^2 bc 2^2 and bc u bc u present
1 MC7208	F_2 BAT93 x 80337	31	23	7	1
2 MC7212	F_2^2 BAT448 x 80377	38	30	7	1?
3 MC7214	F_2^2 BAT561 x 80337	36	18	14	4
4 MC7218	F_2^2 BAT1061 x 80377	39	34	2	3
5 MC7219	F_2^2 BAT1061 x 80415	41	37	2	2?
6 MC7221	F_2^2 BAT1155 x 80385	11	8	2	1?
7 MC7222	F_2^2 BAT1155 x 80377	37	26	10	1
8 MC7223	F_2^2 BAT1235 x 80377	39	29	7	3
9 MC7226	F_2^2 ICA L23 x 80338	25	19	5	1
10 MC7227	F^2 ICA L23 x 80385	22	15	7	0

plants were selected from F_2 populations varying from 171 to 517 plants A minimum of 300 plants is needed for a good chance to select one or more wanted plants while the number of plants for test-crossing per F_2 combination should be raised to 60

The F_3 progenies of the selected F_2 plants were submitted to a confirmation test with BCMV and BYMV as the symptom assessment of the inoculated F_1 test-cross plants is not always simple Gene bc-3 is supposed to confer resistance to both viruses Table 5 gives the results of the confirmation test of F_3 progenies of six from the ten F_2 combinations Families 2 and 10 did not result in selected plants while the F_3 progenies of the selected plants of crosses 5 and 6 were not yet available These crosses will be tested in January 1982 Because F_3 lines 2 3d 4a and 4b were not completely resistant they will be discarded It seems that after all gene bc-3 was not homozygously present in these lines making them susceptible to BYMV But only one of them showed pinpoint lesions with BCMV also to be expected in the other three lines if bc-3 was lacking Seed of the 10 completely resistant lines and of the three F_3 lines not yet screened in a confirmation test will be brought to CIAT in January 1982 for the second backcrossing to CIAT breeding lines

The 30 F_3/F_4 lines selected in 1980 for resistance to BCMV BYMV and anthracnose were again tested with BCMV and four races of Colletotrichum in 1981 Eight lines with complete resistance to BCMV and BYMV and the best resistance to anthracnose were selected and F_4/F_5 seed will be brought to CIAT in January 1982 to be used for the first backcross to CIAT breeding lines if crosses with the F_3/F_4 lines brought to CIAT in November 1980 have not yet been made Four lines have resistance to all races of anthracnose in addition to the resistance to BCMV and BYMV and four to all but one race

Testing of CIAT breeding lines with BCMV-NL3 + 4 + 5 to assess the presence of gene I for an analysis of linkage between seed color and II-genotype The test results of 88 F_3 and F_4 lines from crosses between parents of different seed colors with or without gene I give the impression that a linkage exists between the recessive ii genotype and the red-cream mottled seed coat color as no families were found of this color with II homozygously present in contrary to purple mottled Number 10 however has the desired seed color and is heterogeneous for the I genotype having plants with ii and Ii and/or II Further selection in this population will result in pure lines with ii and II combined with the red-mottled color The isogenic lines then obtained will give good possibilities for studying the linkage concerned

Identification of resistance genes for BCMV in 41 progenitors A total of 42 CIAT progenitors were tested with strains of BCMV for identification of the resistance genes Four have the dominant gene I of which two also have recessive genes for resistance One number is heterogeneous for gene I The identification of recessive genes in most numbers started in 1981 and has to be continued A rather rare combination of recessive genes namely bc-1^2 and bc-2 was found in Bounteous P I 179 005 and P I 313 653 This combination has only

Table 5 Confirmation of F_3 progenies

Line no	IVT stock no	Selected F_3 lines	F_2 plant no	BCMV strains NL3+4+5 Local necrosis	BCMV strains NL3+4+5 Systemic necrosis	BYMV T strain mosaic
1	810655	MC7208 F_3 BAT93 x 80337	1 38	0/10	0/10	0/10
2	666	MC7212 F_3 BAT448 x 80377	2 9	0/10	0/10	8/10
3a	699	MC7214 F_3 BAT561 x 80337	3 2	0/10	0/10	0/10
b	705	MC7214 F_3 BAT561 x 80337	3 8	0/10	0/10	0/10
c	730	MC7214 F_3 BAT561 x 80337	3 33	0/10	0/10	0/10
d	734	MC7214 F_3 BAT561 x 80337	3 37	0/10	0/10	8/10
4a	761	MC7218 F_3 BAT1061 x 80377	4 24	8/10	0/10	8/10
b	766	MC7218 F_3 BAT1061 x 80377	4 29	0/10	0/10	4/10
c	774	MC7218 F_3 BAT1061 x 80377	4 37	0/9	0/9	0/10
7	780	MC7222 F_3 BAT1155 x 80377	5 3	0/10	0/10	0/10
8a	439	MC7223 F_3 BAT1235 x 80377	2 16	0/5	0/5	1/5?
b	447	MC7223 F_3 BAT1235 x 80377	2 24	0/10	0/10	0/10
c	789	MC7223 F_3 BAT1235 x 80377	6 5	0/10	0/10	0/10
9	462	MC7226 F_3 ICA L23 x 80338	3 15	0/8	0/8	0/7

been overcome by strains NL3 and NL5 and the Latin American strain Chile

Identification of BCMV isolates from various Latin American countries BCMV isolates from seeds from various Latin American countries were identified to determine the occurrence and distribution of BCMV strains in those countries A total of 43 seed samples was analyzed for virus infection in 1981 Two seed samples from Argentina four from Bolivia nine from Colombia 22 from Mexico three from Peru and three from Venezuela were investigated for seed infection with BCMV Six samples from Colombia two from Mexico and three from Venezuela could not be infected because of the presence of dominant gene I No seed samples from Peru were infected with BCMV one sample from Mexico carried the Florida strain as did the two Argentinian numbers while one sample from Colombia was infected with strain NL1 and another one with the Florida strain

The identification of BCMV isolates from seed samples of the CIAT gene bank has been completed with this last set of samples The infection rate of at-random samples of the gene bank is too low for an efficient identification procedure A total of 78 BCMV isolates was detected in a large number of seed samples during 6 years of investigation 37 belonged to the type-strain (NL1) 24 to the Florida strain four to the Mexico strain three to the New York-15 strain and 10 to a new one named the Chile strain No strains were found that were basically different from those already known in Holland and the United States The only new one found so far the Chile strain is only slightly different from the Dutch strain NL3

Comparison of necrosis-inducing BCMV strains from CIAT and IVT Two BCMV isolates from CIAT one maintained in variety Calima and one in Dubbele Witte both supposed to be very close to strain NL3 were compared with strains NL3 and NL5 and with the Latin American strain Chile also maintained in IVT The aim was to advise about the best strain(s) for screening use in CIAT to detect I genotypes in breeding lines in a destructive test

The so-called NL3 isolates from CIAT are isolates from the Chile strain It was determined better to use strain NL5 to obtain a systemic necrosis reaction in breeding materials tested in CIAT screenhouses A mixture of NL5 and NL3 is advised to obtain a higher number of local lesions for a better recognition of plants with $bc\text{-}2^2$ and I in which no systemic necrosis appears

Testing of differentials and progenitors with six races of Colletotrichum lindemuthianum Two seed samples from varieties Mexique 222 and P I 165 426 were received from CIAT to check whether their reactions to races of Colletotrichum lindemuthianum are identical with the reactions of the anthracnose differentials with the same name used in IVT Nine progenitors were obtained for screening with a broad set of Colletotrichum races

The CIAT seed sample of Mexique 222 reacted exactly the same as the

IVT differential but the sample of P I 165 426 did not react as it is supposed It was susceptible to all races used and was replaced by a correct seed sample from IVT

Nine progenitors were tested for resistance and inoculated with 10 races of the fungus The results with C 236 a race that overcame the Cornell resistance were unreliable because of insufficient fungus attack The test with this race will be repeated One of the progenitors Antioquia 123 has very good resistance to anthracnose being susceptible only to the alpha race thus having the same resistance spectrum as the differential Mexique 222

Beanfly Resistance Project with AVRDC Taiwan

Beanfly (Ophiomyia phaseoli) is a major insect pest of snapbean in tropical to subtropical Asia and Africa but it does not occur in Latin America The adults of this insect lay eggs in leaf tissue and maggots mine through leaf lamina and petioles into the stem where the insect feeds and pupates As a result of feeding plant growth and yield are severely reduced

A total of 370 CIAT accessions were screened in two lots one during 1977 and the other in 1978 at the Asian Vegetable Research and Development Center (AVRDC) in Taiwan for resistance to beanfly Each entry was planted on the top of a bed 2 m long and 0 75 m wide after 4 to 5 weeks of growth plants were dissected and the number of beanfly maggots and pupae within the stems as well as the number of insect-damaged plants was recorded Based on the number of insects/plant and the percentage of damaged plants 48 accessions showed low to moderate levels of resistance When these entries were screened in an identical manner for the second time only eight showed moderate levels of resistance Seven of these accessions along with two susceptible checks were planted in a replicated test in fall 1979 to confirm the resistance Two entries (G 05478 and G 35023) were significantly less infested than the susceptible checks The performance of these two entries is summarized in Table 6 Although many plants in resistant accessions showed beanfly damage most insects died well before observation whereas the insects in susceptible entries were alive and feeding on stem tissue during observation This indicates a possibility of antibiosis in the resistant materials

One of the accessions G 35023 is being used as a source of resistance in the CIAT breeding program and the F_2s are now being screened at AVRDC to select entries with desirable agronomic characters and beanfly resistance

Table 6 Performance of selected CIAT bean accessions for resistance to beanfly at AVRDC[a]

CIAT accession no	Beanfly maggots pupae/plant (no) [b]	Damaged plants (%)
G 05478	0 50 b	100
G 35023	1 08 b	61
G 00394[c]	5 81 a	100

a Planted 25 Sept 1979 observed 29 Oct 1979
b Means in the vertical columns followed by the same letter are not significantly different at the 5% level
c Susceptible check