PATHOGENIC VARIABILITY OF AND BACTERIOCIN PRODUCTION PROJECT

SEMI - ANNUAL REPORT NO. 3

JULY 1, 1988 THROUGH DECEMBER 31, 1988

WINROCK INTERNATIONAL INSTITUTE FOR AGRICULTURAL DEVELOPMENT
AND
INSTITUTE OF AGRICULTURE AND ANIMAL SCIENCES,
MINISTRY OF EDUCATION AND CULTURE
HIS MAJESTY'S GOVERNMENT OF NEPAL

(USAID OFFICE OF SCIENCE ADVISOR
GRANT NO. 367-5542-G-00-7020-00)

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PREPARED BY:

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A C K N O W L E D G M E N T S

All staff of the PVBP project have helped in the preparation of this report. Mr. Sundar Man Shrestha Co-Investigator, of this project had primary responsibility for collecting the data of the research results, editing and completing the report.

Thanks also to ARPP/WI Chief of Party, Dr. A. John De Boer for overall project management and also proof reading of the report.

Special credit goes to Mr. Janak Shrestha, Administrative Assistant of this project for word processing and production of the report.

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I. INTRODUCTION

Rice is the most important crop covering the largest area of arable land in Nepal. It is grown throughout the Kingdom from plains to high hills. However, the major rice growing area lies in the Tarai belt. Average yield of this crop is going down because of several factors. Diseases are one of the most important major constraints limiting yields of this crop.

Bacterial leaf blight (BLB) caused by Xanthomonas campestris pv. oryzae is one of the most destructive diseases of rice not only in Nepal but throughout the rice growing countries of the world. It has been reported from Japan, India, Indonesia, Philippines and many other rice growing areas. In Nepal, the disease was first reported from eastern Tarai belt a few years ago but now it has already spread throughout the Tarai belt and valley in the hills after introduction of improved, high yielding rice cultivars. Even the local cultivars are getting more and more susceptible to BLB attack.

Looking towards the dangerous situation of this disease, the project "Pathogenic Variability of and Bacteriocin Production by Xanthomonas campestris pv. oryzae" was developed, with the objective of controlling BLB of rice through host resistance and development of a biocontrol agent.

The total grant to carry out this research Project is estimated at US $ 120,000. for a period of three and one-half years starting from July 1, 1987. The grant is financing salaries, honorariums, equipment, supplies, training, consultation and other direct cost and the Winrock International management fee. The major changes in line item funding allocations from the original budget categories are implemented through Memorandums of Understanding between the Sub-grantee and Winrock International. The Memorandum of Understanding is attached to this report. (please see Annex No. I)

During the past six months (July 1, 1988 through December 31, 1988), project activities completed under this project have been described in this report. Substantial progress has been made, details of which are presented in the following sections:

II. PROJECT AIMS AND SPECIFIC OBJECTIVES

A. PROJECT AIM:

The project aims to manage bacterial leaf blight of rice through host resistance and development of a bio-control agent.

SPECIFIC OBJECTIVES

Attempts will be made to investigate the **Pathogenic Specialization in X.c. pv. oryzae** which will help the project to develop differential verities against the pathogenic bacterium in Nepal.

Those monogenic differentials could be efficient and ideal for control. Subsequently, this breakthrough would be very useful to the plant pathologists and plant breeders to utilize them as diverse resistance donors and then to develop an international set of differentials on a functional gene basis under the auspices of the International Rice Research Institute (IRRI) and several other national rice research programs.

Conversely, if the bacteriocin could be commercially cultured and supplied to the markets its use could greatly benefit rice growing countries. It is likely that this technology would be simple, cheap, pollution free and effective. A successful project would thus benefit many countries and people. With wide application of these research findings, one of the crucial problem in rice and rice-based farming systems will be solved. Thereafter food production of the countries will be augmented, which ultimately helps to fulfill the objectives of AID.

The most unique aspect of this project is to develop for commercial use, a specific bacterial strain/bacteriocin to control the bacterial blight of rice. This could be achieved by establishing high numbers of the non-pathogenic plants. Commercial manufacture of this strain would assist in the introduction of biological methods for controlling leaf blight in rice fields.

III. OVERVIEW OF PROGRESS

To achieve the goal and objectives of this project as per the grant agreement, the researcher and staff have made steady progress in implementing of the project activities

The Principal Investigator of this project, Mr. Tika B. Adhikari, is currently under a fellowship from the International Rice Research Institute, Philippines for two years starting from May 1987 and will be returning to Nepal in May, 1989 following completion of his coursework. In his absence, the Acting Principal Investigator, Mr. Sundar Man Shrestha, has been supervising work on this project.

Procurement order for equipment which was placed with Winrock International's headquarters in Arkansas, has arrived and has been issued to PVBP project Rampur and research work has been conducting with these facilities. The glasshouse which was constructed under this project was also handed over to Institute of Agriculture and Animal Science, Rampur (the first green house at the Institute) and all the non-expendable items (equipment) has been transferred to the IAAS store book. All these facilities will be utilized by PVBP project until this project is terminated.

The Principal Investigator had an opportunity to attend a Conference on Plant Pathology held in Kyoto, Japan from August 20-27, 1988. He participated from IRRI, Philippines and all expenses were supported by PVBP funds.

IV. BUDGET AND EXPENDITURES

The total budget of this project is US $ 120,000.00. From the project starting date of July 1, 1987 through December, 1988, project expenditures were US $ 98,399.66 including local and Headquarter expenses. This represented about 82% of the total funds.

A summary of expenditures is shown in the following table:

TABLE NO. 1

Expenditures incurred as of December, 1988 ($)

S. NO.	EXPENDITURE LINE ITEMS	BUDGET	TOTAL EXPENSES	BALANCE REMAINING	REMAINING PERCENTAGE
1.	SALARIES & WAGES	35,770.00	15,430.14	20,339.86	58.63%
2.	EQUIPMENT	36,300.00	42,026.07	(5,726.07)	-15.77%
3.	TRAINING	3,600.00	1,568.23	2,031.77	56.44%
4.	CONSULTATION	4,500.00	1,739.61	2,760.39	61.34%
5.	TRAVEL & PER DIEM	10,000.00	7,718.86	2,281.14	22.81%
6.	OTHER DIRECT COST	16,000.00	18,817.30	(2,817.30)	-17.61%
	TOTAL DIRECT COST	106,170.00	87,300.21	18,869.79	17.77%
7.	WI/MANAGEMENT FEE	13,830.00	11,099.45	2,730.55	19.74%
	GRAND TOTAL	120,000.00	98,399.66	21,600.34	18.00%

V. REVISION OF BUDGET

Following is the estimated budget for PVBP project including local cost items:

BUDGET LINE ITEM IN DETAIL

COST ELEMENT	ORIGINAL BUDGET	REVISED BUDGET
SALARIES & WAGES	46,470.00	35,770.00
EQUIPMENT	22,300.00	36,300.00
TRAINING	3,600.00	3,600.00
CONSULTATION	4,500.00	4,500.00
TRAVEL & PER DIEM	15,000.00	10,000.00
OTHER DIRECT COST	14,300.00	16,000.00
TOTAL DIRECT COST	106,170.00	106,170.00
WI/MANAGEMENT FEE	13,830.00	13,830.00
GRAND TOTAL	120,000.00	120,000.00

VI. EQUIPMENT PROCURED FROM WI/HEADQUARTERS

Following equipments which were ordered to Winrock International Headquarter USA have arrived in Nepal and issued to PVBP Project Rampur.

	DESCRIPTION		QUANTITY
1.	ELECTRIC VERTICAL STERILIZER, 23 SPECIAL		1. EA
2.	AUTOCLAVE GLOVE ORANGE 1 PR/PK 12PK/CS CAT. # 11 394 299		1. CS
3.	DEC-0 GRAM BAL SGL HNG PAN,	CAT. # 02 021 5	1. EA
4.	PH/MV METER LOW COST DIGITAL/SLOP CONTROL, ATC OPTION FOR 230 VOLT, 50/60 HZ,H3700-1		1. EA
5.	ELECTRODE GLASS COMBO.	CAT. # 13 620 285	1. EA
6.	ELECTRODE PENCIL GEL COMBO,	CAT. # 13 620 290	1. EA
7.	SHAKER PWR UNIT 2 SPEED 230/50/60,	CAT. #1426511	1. EA
8.	FLASK HOLDER 125 ML,	CAT #14 270C	1. EA
9.	FLASK HOLDER 250 ML,	CAT. #14 270D	1. EA
10.	CARRIER PLATE SM 21/x12 IN,	CAT. #14 269	1. EA
11.	SPECTROPHOTOMETER, MODEL 35,	CAT. #8410-R30	1. EA
12.	EXCITER LAMP, III/55,	CAT. #8411-M38	2. EA
13.	CUVETTE ADAPTER, 10x75 MM,	CAT. #8411-D10	1. EA
14.	DIDYMUM FILTER,	CAT. #8411-L10	1. EA
15.	LIGHT SHIELD CAP,	CAT. #8411-L90	1. EA
16.	GRAPH PAPER, PAD 50 SHEETS,	CAT. #8411-M20	1. PD
17.	HOT PLATE, 240 VOLTS, 50 HS,	CAT. #59922-H26	1. EA
18.	PIPETTE, 1 ML 1/100 CS OF 500,	CAT. #7536-N12	1. CS
19.	PIPETTE, 2.2 ML, CASE OF1000,	CAT. #7585-H20	1. CS
20.	INCUBATOR, MODEL 4EG,	CAT. #6118-L55	1. EA
21.	FISHER JUNIOR OVEN	CAT. #13-261-11	1. EA
22.	10 TUBE MODULAR TEST TUBE RACK	CAT. #J06733-40	1. EA
23.	MICRO CENTRIFUGE, MODEL 5415,	CAT. #04978236B	1. EA
24.	TUBE ADAPTER LARGE 20/PG,	CAT. #04 978 243	1. PK
25.	UNWIRE TEST TUBE RACK, WH,16MM,	CAT. #14 809 24	5. CS
26.	BLOCK 12 x 13mm SPECIAL		1. EA
27.	CANNON A-1 PROGRAM CAMERA WITH A 50 MM LENS ALSO A 70-210 MACRO SIGMA LENS AND CASE		1. EA
28.	REPLICATOR, MULTIPOINT MANUAL TYPE, 48 PINS		2. EA
29.	MAXI-MIX II MIXER 240V 50/60 HZ, 12 814 6		1. EA
30.	PIPET AID WITH FILTER 240V (7775-217), 23 SPECIAL		1. EA
31.	CASE PARAFILM 2 IN. X 250 FT./ROLL 24 ROLLS/cs 13-374-17		1. EA
32.	PK PIPETMAN STYLE TIPS PK/1000, 21 374 E		1. EA
33.	PK PIPETMAN STYLE TIPS PK/1000, 21 381 10P		1. EA
34.	ROLLS COLORED LABEL TAPE, 3/4" WHITE,	11-880-5A	3. EA
35.	ROLLS COLORED LABEL TAPE, 3/4" YELLOW,	11-880-5B	3. EA
36.	ROLLS COLORED LABEL TAPE, 3/4" RED,	11-880-5E	3. EA
37.	ROLLS COLORED LABEL TAPE, 3/4" GREEN,	11-880-5C	3. EA
38.	ROLLS COLORED LABEL TAPE, 3/4" BLUE,	11-880-5G	3. EA

VII. GLASSHOUSE AND OTHER NON-EXPENDABLE ITEMS ISSUED TO IAAS, RAMPUR

Following non-expendable items and glasshouse building have been received by IAAS, Rampur. These items and facilities will be utilized by PVBP Project until its termination and after the facilities will be used by IAAS Rampur.

a. TERMS AND CONDITION OF RECEIPT FROM IAAS RAMPUR

As per the Grant Agreement between Winrock International, Kathmandu and Institute of Agricultural and Animal Science, Central Campus, Rampur, Chitwan, Nepal, all the essential laboratory equipment and office furniture were ordered and the glasshouse was constructed in the Institute of Agriculture and Animal Science Central Campus, Rampur, Chitwan, Nepal by Winrock International under Pathogenic Variability of And Bacteriocin Production Project (PVBP Project) Grant No. 367-5542-G-7020-00 to run PVBP Project. The glasshouse was built attached with one office room plus one toilet.

We have received all the above stated items and equipment and office furniture as per attached list. The glasshouse is in sound condition with following terms:

TERMS

At present all the laboratory equipments, office furniture and glasshouse with office room will be utilized by the Pathogenic Variability of And Bacteriocin Production Project (PVBP Project). After the termination of the Project (PVEP) all the laboratory equipment, office furniture and the glasshouse with office room will be utilized by the Institute of Agriculture and Animal Science, Central Campus,
Rampur, Chitwan, Nepal.

Received by : _____
Dean IAAS
Rampur, Nepal

Turnover by: _____
A. John De Boer
Chief of Party

Date: _____

Date: _____

Witness: _____
Puspa Raj Jamalkatel
Acting store-keeper
IAAS, Rampur

Witness: _____
Sundar Man Shrestha
Acting P.Investigator
PVBP Project, Rampur

b. List of Non-Expendable Items

S.No.	Items	Quantity
1.	Measuring Tape, 50 mtrs.	1. pc.
2.	Ice box, Plastic	2. ,,
3.	Scissors	2. ,,

Contd...\...

S.No.	Items	Quantity
4.	Metal tape, 3.5 mtrs.	1. ,,
5.	Office Almirah, steel 60" X 33" X 17"	1. ,,
6.	Filling cabinet steel, 3 drawers	1. ,,
7.	Isolation chamber complete set with fridge guard 110 V. and Stavol	1. ,,
8.	Remington typewriter R-528804, English	1. set
9.	Standard office table sunmica top	2. pcs.
10.	Standard office chair with arms foam	2. ,,
11.	Table fan	1. ,,
12.	Steel pot	1. ,,
13.	Stainless steel bowl	2. ,,
14.	Air-cooler, Hitachi	1. ,,
15.	Electric Vertical Sterilizer (Autoclave)	1. ,,
16.	Balance, Single hanging pan	1. ,,
17.	pH meter low cost digital/slop control	1. ,,
18.	Electric shaker, complete set	1. ,,
19.	Spectrophotometer, model 35	1. ,,
20.	Hot plate, 240 volt	1. ,,
21.	Voltage stabilizer (stavol)	1. ,,
22.	Incubator, model 4EG	1. ,,
23.	Fisher junior oven	1. ,,
24.	Micro centrifuge, Model 235, complete set	1. set
25.	Canon A-1 program camera with q 50mm lens also A 70-210 macro sigma lens and case	1. set
26.	Pipette aid	1. pc
27.	Maxi mix II	1. ,,
28.	Replicator, 48 pins	2. pcs

VIII. PATHOGENIC REACTION OF RICE IN PARWANIPUR NET-HOUSE

Pathogenic reactions expressed by Xanthomonas campestris pv. oryzae isolates on three varieties of rice in Parwanipur Net-house (1988).

The rice varieties TN - 1, Janaki and IR - 64 were grown in the pots supplied with required amount of NPK in Parwanipur net-house during 1988. Seventy different isolates of Xanthomonas campestris pv. oryzae were prepared. Fresh and pure cultures were made in the laboratory at Rampur. These culture tubes were taken to Parwanipur and diluted by adding 10 ml. distilled water in each tube and thoroughly shaken to prepare homogeneous suspensions. Each isolate was inoculated in TN -1, Janaki and IR - 64 by leaf clipping methods using sterile scissors dipped in the suspension of bacterial isolates. The infection on these rice varieties by different isolates were observed after 15, 21 and 28 days after inoculation. The lesion length was measured in cm.

All the Xanthomonas campestries pv. oryzae isolates were found infective in the rice varieties TN -1, Janaki and IR-64 (Table - 2). However, there was variation in lesion length between varieties by the same isolate and also on the same variety inoculated by different isolates. In general TN - 1 was more susceptible, IR - 64 was less susceptible and Janaki was intermediate to these bacterial isolates. On the basis of differential reaction shown on these varieties the isolates can be grouped in different categories.

Isolates NX0 41, 64, 66, 81, 110, 123, 124, 132, and 140 reacted more severely on all the three rice varieties. Isolates NX0 5, 15, 17, 19, 22, 23, 33, 34, 43, 46, 48, 49, 55, 67, 70, 75, 76, 77, 78, 86, 98, 103, 104, 106, 113, 114, 117, 120, 125, 129, 135, 141, 143, 145, 154, 155, 156, 161 and 163 were found more susceptible to TN - 1 and Janaki. Isolates NX 39, 44, 52, 59, 97, 100, 101, 112, 131, 134, 136, 137, 147, 153, 159, 160, 165, and 171 were more susceptible to TN - 1 and less infective to Janaki and IR-64. Isolates NX0 8, 21, and 62, were more infective on Janaki and less on TN-1 and IR64. Isolate NX0 80 was found most virulent for infection in all the three varieties. Other virulent strains were observed in NX0 19, 43, 66, 81, 117, and 120. These groups of isolates may be further tested on differential rice cultivars to identify the races existing in Nepal.

TABLE NO. 2.

Pathogenic reaction expressed by different isolates of Xanthomonas Campestris pv. oryzae on three varieties of rice in Parwanipur Net house during 1988.

ISOLATION(NXO)	TN 1	JANAKI	IR-64
5.	10.19	10.80	9.16
8.	6.16	10.58	7.27
15.	12.16	10.71	8.11
17.	10.58	10.58	7.30
19.	15.77	11.47	9.83
21.	8.41	11.27	8.38
22.	10.44	10.63	8.80
23.	12.49	11.19	8.22
33.	10.49	11.05	7.80
34.	11.41	10.66	9.30
39.	10.55	8.85	9.72
41.	10.16	10.60	10.70
43.	13.35	11.88	8.60
44.	11.41	8.94	9.47
46.	11.30	10.58	9.16
48.	10.80	10.86	8.66
49.	11.75	10.09	9.22
52.	10.94	9.94	8.94
55.	10.05	10.41	7.69
59.	10.21	9.52	9.91
62.	9.77	11.52	8.10
64.	12.80	10.16	10.86
66.	13.72	10.55	11.13
67.	10.47	10.83	9.24
70.	10.38	11.63	6.85
75.	11.72	12.60	9.63
76.	10.60	11.75	9.38
77.	10.66	10.88	7.77
78.	10.74	10.44	8.55
80.	17.08	15.00	10.63
81.	13.05	11.94	10.08
86.	10.83	10.02	8.88
97.	10.91	9.41	8.74
98.	10.99	10.96	8.00
100.	11.11	9.85	8.91
101.	11.02	9.60	8.10
103.	11.08	11.71	8.27
104.	11.94	11.47	9.13
106.	10.44	1.71	7.97
110.	11.55	10.86	10.66
112.	10.66	6.16	9.13
113.	10.25	12.38	9.72

Table 2. (Cont'd)

ISOLATION(NXO)	TN 1	JANAKI	IR-64
114.	10.80	10.41	8.36
117.	16.16	10.77	8.97
120.	13.16	10.83	9.02
123.	10.66	10.21	10.33
124.	10.75	12.10	10.24
125.	12.38	10.02	9.08
129.	10.77	13.16	9.85
131.	10.85	9.94	9.33
132.	12.52	10.77	10.91
134.	10.36	9.83	10.55
135.	12.97	11.33	9.86
136.	12.08	9.38	9.47
137.	11.44	9.94	9.91
140.	10.94	10.60	10.47
141.	12.44	10.13	8.60
143.	11.85	13.10	7.86
145.	11.63	10.72	7.72
147.	11.30	9.94	7.46
153.	10.66	9.25	9.88
154.	11.60	11.94	9.94
155.	12.49	11.30	8.22
156.	11.66	10.66	8.72
159.	10.99	9.86	5.83
160.	10.21	9.75	9.38
161.	11.80	10.99	7.30
163.	11.46	13.02	8.47
165.	10.38	9.91	7.63
171.	10.69	9.80	9.10

IX. SCREENING OF RICE GERMPLASM AGAINST BACTERIAL LEAF BLIGHT

Screening of rice germplasm against bacterial leaf blight caused by *Xanthomonas campestris pv. oryzae.*

To investigate the source of resistance against bacterial leaf blight (*Xanthomonas campestris pv. oryzae*), rice germplasm was collected fresh from different parts of the country. A total of 836 different strains were collected out of which twelve strains were received from IRRI, Philippines, one - hundred twenty-six were collected from National Rice Blast Nursery, Rampur, Chitwan and rest of the germplasm were collected from different locations covering thirty-three districts which occupy major rice growing areas of the Kingdom. One set of germplasm was sent to Parwanipur for field screening trail and one set of germplasm were grown in nursery bed at Rampur.

Layout of the field was done after ploughing, harrowing and leveling. One square meter plot was made in duplicate for transplanting each strain. Each plot was supplied with nitrogen and phosphorus at the rate of 120 and 50 kg. per hectare through DAP and Urea. Nitrogen was supplied with split dose, half at the time of field preparation and remaining half was top dressed at tillering and booting stage.

Seedlings were transplanted in the experimental plots at the rate of nine hills per plot. Sufficient amount of water was supplied to flood the plots and weeding was done as needed. The germplasm were inoculated with the bacterial suspension of an isolate by leaf clipping method at tillering and booting stage.

A set of germplasm were also grown in the glasshouse at Rampur by transplanting them in the earthen pots supplied with required amount of manures and fertilizers. They were also inoculated by bacterial isolate using the same leaf clipping method.

Percentage of BLB reaction in the field was noted on the basis of visual observation taken at 15, 21 and 28 days after inoculation and averaged. However, in the glasshouse, the percentage of infection was calculated by measuring the lesion length and total length of the leaf.

a. Results

Three hundred and twelve rice germplasm inoculated by the virulent isolate (NX0 80) in the glass house of Rampur revealed that 53 germplasm were highly resistant (no infection), 14 were resistant (1 - 5% infection), 85 were moderately resistant (6 - 15% infection), 74 were moderately susceptible (16 - 25% infection), 59 were susceptible (26 - 40% infection and 16 were highly susceptible (above 40% infection). In the Parwanipur field screening trial, none of the cultivars were found without infection.

However, seven cultivars have shown resistance against bacterial blight. They were Parewapankha (Tarai area), Gurdi seto (Kaski), Ghaiya (Parsa), Nokhi (Parsa) Karma (Sunsari), Balam sai (Dhanusa) and Odhakamal (Sarlahi) (Table 3).

Out of 835 germplasm grown in the nursery at Rampur, 83 strains did not germinate. Seven-hundred and fifty-three strains were transplanted in the field for evaluating them against bacterial blight infection. One-hundred and twenty-seven cultivars were found without any infection. They were Rasuwa and Baganighaiya (Gorkha), Tadi Masuli and Motisari (Chitawan), Sattari and Begadi (Rupandehi), Khaltekhola (Kaski), Rasuwa (Palpa), Chandan, Cola and Lankura (Tanahu), Kalo lahara Thulo, Anpijhutte, Mane Rate and Naulo (Lamjung), Namai and Pargtiuli (Surkhet), Mansara and Sano Masino INawalparasi), Gokalsar, Gangasar, Anadi, Rambali, Laltangar, Lohasagar, Phoolkumari, Kushumkafki, Katibarod, Dhanusbar (East Tarai) Hathijhula, Mansari, Ratinand Bahorni (Rautahat), Karma, Jirasari, pokhrelimasino, Basmati and Bhadaiya (Sunsari), Marsi, Silangdarahi, Muturi, Lohajara, Kasturi, Anadi, Mahajosini, Sohawani and Nokhi (Bara), Kariyakomod (Sunsari), Basmatimehi (Siraha), Panjhali and Nanhiya (Saptari), CH - 45, Setikatike, Chaiya and Binderwari (Parsa), Chinaidhan and Pahelomasino (Kavrepalanchok), Kalininiya Bindeswari, Najir and Mihi (Jhapa), Kasma local, Ganuwa, Agnisayar Najir, Jasawa, Roopkamal, Basmati, Pokhar, Bhadaiya (Morang), Kaman and Dhudhalam (Mahottari), Dhumakharaha, Harinkor, Balomsai, Bhojiyadhusari, Kariyakamar, Panjhali, Dhudkamal and Bhorangiadhusari (Sarlahi), CH-45, Jhaberi, Rajbiraj, Kalmsayar and Basmatimohi (Dhanusa), Malgkit, CH-209 and DV-85 (Philippine), Carbei - 4, KK 15-41-6-2, B 39810-PN-185-2-1, BR 316-15-4-4-1, PAV 50-8-25-1, IR-46, KK15 (NR 15015), Ta-Nae-Tae, Rodina, IR 9202-6-1-1, Swat-2, IR 9761-19-1, Chhomro, IR 31787-140-2-3-1-3, NR274-7-3-1-1, IR 31787-16-1-2,

IR-36 and IR 267 16 12 2 1 3 (NRBN, Rampur). Sixty -three cultivars had shown resistance against BLB with up to 5 percent leaf infected. One-hundred cultivars had infections ranging from 16-25 percent leaf area covered by lesions and one-hundred eighty cultivars were found susceptible to BLB with 26-40 percent leaf area infected. More than seventy strains were highly susceptible to BLB. They were Jamringe and Tulsi (Gorkha), Dhudhraj (Chitawan), Gauriya, Chaitedhan and Mansara (Kaski), Jaran (Shyanja), Thapachini (Palpa), Taichung (Tanahu), Pakjohajiruwa, Jarmany, Seto Andi (Lamjung), Tilki (Dang) ,Simthara (Surkhet), Rupakhola, Karna, Japandhan, Lalguras, Dhudhraj, Krishnabeli, Sanjeera, Bhandwa Anadi, Handiphool, Basbareli and Basphool (Rautahat), Chanapur, Karma and Katkamal (Sunsari), Ratobasmati, Goradi, Setokateke (Bara), Panjhali (Saptari), Japani marsi (Chitawan), Localdhan, Taiwanise, Pokhreli masino, Chiniyadhan and Taichung (Kavrepalanchok), Champasari, Birunphool, Masuli and Panikamal (Jhapa), Handiphool, Basmati, Satraj, Roopkmal, Madise, Najir and Jhardhan (Morang), Khahora, Qudhakamal, Harinkar, Boodha Bahadur, Dhumakhareha and khahare (Sarlahi), Darmali (Sankhuwasabha), Tatop (Philippine), IET 6748, Ir 10205-37-1-3 and NR 275-674-2-3-1 (NRBN, Rampur).

TABLE NO. 3.

Screening of rice germplasms against bacterial leaf blight caused by *Xanthomonas campestris* pv. *oryzae*

BLB reaction in percentage

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
1.	11.10	8.75	X
2.	8.50	10.70	0.0
3.	10.00	9.02	X
4.	X	9.69	X
5.	29.60	11.68	66.00
6.	X	-	X
7.	18.30	11.19	X
8.	8.80	10.22	X
9.	18.20	11.19	X
10.	8.10	10.01	X
11.	4.30	11.43	12.33
12.	X	12.38	X
13.	3.00	8.96	X
14.	51.60	10.64	10.00
15.	33.00	13.30	X
16.	X	9.12	9.00 *
17.	0.0	11.86	0.0
18.	46.00	13.95	X
19.	9.00	16.21	23.00
20.	X	11.16	X
21.	X	10.62	7.33 *
22.	0.0	14.24	0.0
23.	11.60	9.69	X
24.	X	11.68	X
25.	22.90	12.49	X
26.	6.00	10.94	X
27.	3.50	10.62	X
28.	4.00	9.83	11.66
29.	0.0	13.16	10.00
30.	0.0	11.79	X
31.	3.50	11.57	5.33
32.	7.30	10.36	X
33.	18.80	9.66	X
34.	30.80	9.94	X
35.	9.00	10.34	X
36.	17.30	13.55	14.33
37.	X	10.16	13.00 *
38.	8.00	9.81	X
39.	11.00	10.84	X
40.	26.00	10.18	X
41.	8.30	9.75	19.00
42.	3.70	10.21	X

Table 3.(Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
43.	5.00	9.61	X
44.	6.30	9.07	34.66
45.	14.30	9.19	X
46.	44.60	10.21	15.33
47.	83.30	9.13	8.00
48.	19.00	9.52	17.33
49.	16.60	11.11	15.00
50.	12.50	11.22	0.0
51.	0.0	10.46	X
52.	2.00	9.58	22.66
53.	6.00	8.74	5.00
54.	27.00	10.44	X
55.	35.30	9.79	13.00
56.	18.00	10.99	X
57.	0.0	9.16	X
58.	0.0	0.02	X
59.	7.60	8.99	X
60.	10.60	8.84	X
61.	X	8.72	13.00 *
62.	22.80	9.38	X
63.	X	X	26.00 *
64.	9.30	10.44	X
65.	18.30	10.27	5.66
66.	27.60	10.38	X
67.	4.60	9.16	X
68.	3.30	8.94	25.00
69.	15.00	9.38	8.00
70.	15.00	9.94	0.0
71.	1.00	9.27	0.0
72.	2.50	9.26	0.0
73.	25.00	12.71	X
74.	20.60	11.44	X
75.	2.60	9.55	X
76.	16.00	9.25	X
77.	16.60	13.0	X
78.	46.60	9.13	X
79.	12.00	10.00	X
80.	5.00	9.66	0.0
81.	11.60	8.67	0.0
82.	6.00	9.22	X
83.	0.0	8.81	X
84.	7.30	8.14	X
85.	2.30	8.27	0.0
86.	55.00	10.16	X
87.	15.00	10.00	X
88.	4.00	8.60	X
89.	6.00	8.61	0.0
90.	30.00	8.96	X
91.	14.00	8.66	X

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
92.	8.30	9.43	X
93.	X	8.61	X
94.	11.00	7.32	X
95.	31.60	11.10	X
96.	53.60	11.71	X
97.	X	X	X
98.	16.00	8.96	0.0
99.	16.30	8.94	X
100.	30.00	9.01	X
101.	9.50	8.91.	X
102.	8.00	8.60	X
103.	3.30	10.28	0.0
104.	20.00	7.73	X
105.	31.60	8.07	32.00
106.	6.60	8.15	X
107.	5.00	8.77	X
108.	16.00	8.71	6.00
109.	8.60	9.32	0.0
110.	22.00	10.08	X
111.	8.50	9.52	0.0
112.	11.30	8.60	0.0
113.	3.00	8.56	0.0
114.	5.60	8.66	X
115.	13.60	8.58	X
116.	20.30	9.10	X
117.	19.30	10.71	14.00
118.	16.00	9.11	10.33
119.	11.30	8.15	33.33
120.	22.00	7.40	X
121.	12.60	9.37	8.00
122.	7.00	8.25	0.0
123.	9.60	8.59	0.0
124.	X	10.21	27.00
125.	X	7.47	X
126.	X	9.61	12.00
127.	12.30	8.29	X
128.	13.30	6.84	X
129.	32.00	9.80	27.66
130.	16.30	8.19	11.66
131.	43.00	8.72	X
132.	16.60	7.60	X
133.	2.00	7.46	X
134.	7.30	8.05	X
135.	13.30	9.40	X
136.	14.30	7.74	X
137.	20.00	10.90	X
138.	25.60	10.91	X
139.	4.00	7.41	X
140.	4.50	7.57	11.00

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
141.	0.0	8.26	0.0
142.	7.50	10.91	X
143.	47.00	8.74	X
144.	17.60	7.87	X
145.	2.00	10.52	31.00
146.	3.00	7.99	7.00
147.	15.00	8.01	X
148.	11.60	9.59	7.00
149.	17.00	10.62	X
150.	17.60	7.28	24.00
151.	77.00	9.03	X
152.	33.30	8.62	X
153.	24.60	7.63	X
154.	15.00	10.21	X
155.	31.00	8.44	X
156.	3.00	9.90	0.0
157.	11.50	8.10	X
158.	X	9.68	X
159.	4.00	9.87	0.0
160.	0.0	8.87	X
161.	4.00	9.52	X
162.	X	9.77	X
163.	5.00	8.87	X
164.	6.00	9.08	X
165.	X	8.86	X
166.	46.90	8.21	X
167.	21.30	8.95	X
168.	25.00	10.55	X
169.	1.50	9.78	X
170.	0.0	8.84	0.0
171.	0.0	9.35	7.00
172.	11.10	9.75	X
173.	5.00	9.18	X
174.	4.50	8.93	X
175.	8.50	8.54	X
176.	3.60	8.51	8.00
177.	6.50	7.78	0.0
178.	6.00	X	X
179.	4.30	9.72	X
180.	15.30	8.79	X
181.	X	8.57	X
182.	8.30	8.37	X
183.	1.90	7.36	X
184.	10.60	9.61	X
185.	25.00	8.43	X
186.	16.60	8.25	X
187.	24.00	9.11	X
188.	16.30	8.14	19.33

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
189.	X	8.90	X
190.	12.30	7.82	19.66
191.	X	8.42	X
192.	14.60	8.81	X
193.	21.30	7.95	X
194.	18.60	10.57	X
195.	0.0	8.40	31.00
196.	5.00	7.88	X
197.	X	7.66	X
198.	11.30	7.68	0.0
199.	33.30	8.71	X
200.	31.60	8.03	X
201.	4.60	8.80	9.00
202.	4.60	9.15	6.33
203.	0.0	9.51	X
204.	13.90	8.44	4.00
205.	16.50	10.77	10.00
206.	X	8.25	X
207.	6.00	8.22	X
208.	45.00	8.78	X
209.	12.60	8.88	X
210.	40.00	6.76	X
211.	14.60	7.97	X
212.	11.00	8.77	X
213.	15.00	8.37	X
214.	5.60	8.91	35.00
215.	0.0	9.99	X
216.	36.60	8.84	X
217.	58.30	8.35	X
218.	1.00	8.93	4.00
219.	2.30	8.38	17.33
220.	5.00	7.69	10.33
221.	14.30	8.76	15.66
222.	7.60	8.31	13.00
223.	3.60	7.88	27.33
224.	38.60	8.23	X
225.	0.0	9.76	X
226.	0.0	10.04	X
227.	15.00	9.82	X
228.	20.00	7.69	X
229.	15.30	8.62	X
230.	56.60	9.14	X
231.	33.30	9.36	20.22
232.	6.00	8.40	23.00
233.	38.60	9.69	X
234.	10.00	8.55	3.00
235.	25.00	10.00	13.00
236.	20.30	7.24	16.00

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
237.	33.60	7.89	22.33
238.	15.00	9.48	X
239.	15.30	8.11	X
240.	66.60	9.92	X
241.	12.60	9.20	X
242.	7.60	7.86	25.00
243.	15.60	8.24	X
244.	18.30	7.75	12.00
245.	20.00	8.00	X
246.	12.30	7.65	22.00
247.	15.00	8.52	20.00
248.	19.60	9.43	X
249.	1.00	8.21	5.00
250.	7.30	10.29	X
251.	13.60	10.28	6.00
252.	21.60	7.66	18.33
253.	41.30	9.83	6.33
254.	7.60	7.40	0.0
255.	5.30	8.51	X
256.	11.30	8.83	X
257.	29.30	9.49	9.33
258.	26.30	8.17	X
159.	15.60	7.37	11.33
260.	37.30	8.19	X
261.	17.30	8.37	X
262.	28.30	8.66	X
263.	35.30	8.24	X
264.	25.60	7.90	11.00
265.	15.80	7.97	X
266.	16.60	8.38	16.33
267.	7.00	8.17	10.00
268.	12.00	8.61	0.0
269.	31.60	7.73	X
270.	13.30	8.28	X
271.	9.30	8.84	0.0
272.	3.60	7.64	X
273.	25.00	8.84	X
274.	33.30	8.66	X
275.	15.60	10.09	X
276.	27.30	7.29	X
277.	29.00	7.29	X
278.	16.00	7.52	X
279.	0.0	7.39	X
280.	60.00	8.55	X
281.	27.30	7.80	X
282.	10.00	7.79	0.0
283.	15.00	8.98	0.0
284.	0.0	9.32	X

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
285.	X	7.28	X
286.	14.30	6.98	0.0
287.	17.60	9.29	X
288.	27.30	8.26	19.00
289.	11.00	8.73	27.00
290.	17.30	9.76	18.00
291.	0.0	7.90	X
292.	25.00	10.06	X
293.	35.00	9.96	7.66
294.	0.0	12.15	12.00
295.	X	9.38	X
296.	0.0	8.05	X
297.	15.00	10.29	X
298.	5.00	7.18	0.0
299.	70.00	8.32	X
300.	16.30	10.39	25.33
301.	10.00	10.90	19.00
302.	27.30	8.97	X
303.	15.60	10.18	X
304.	10.30	11.43	25.00
305.	0.0	7.78	X
306.	42.00	9.75	38.00
307.	0.0	8.46	X
308.	18.60	9.26	X
309.	26.60	9.61	X
310.	9.00	7.94	X
311.	28.30	8.65	X
312.	13.60	11.86	X
313.	20.00	8.86	0.0
314.	15.00	7.74	5.00
315.	53.30	8.11	X
316.	56.60	10.16	22.00
317.	22.30	9.28	X
318.	15.00	9.51	X
319.	22.00	10.11	10.33
320.	32.00	9.50	33.33
321.	10.60	9.70	X
322.	12.60	9.16	X
323.	14.30	8.93	X
324.	3.60	10.16	6.00
325.	6.60	7.16	X
326.	12.30	8.66	X
327.	18.30	8.79	X
328.	17.30	6.05	X
329.	35.60	7.55	25.00
330.	9.00	5.84	36.00
331.	33.30	6.69	28.00
332.	41.60	4.74	20.00

Table 3. (Cont'd).

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
333.	21.60	6.27	19.33
334.	11.60	8.34	X
335.	0.0	9.18	X
336.	0.0	6.29	X
337.	0.0	7.88	X
338.	18.60	8.97	21.66
339.	12.30	6.78	X
340.	9.00	5.13	X
341.	12.20	6.41	29.00
342.	10.00	7.54	X
343.	0.0	8.56	X
344.	0.0	6.97	X
345.	15.00	7.28	X
346.	3.00	7.27	0.0
347.	33.30	8.16	X
348.	34.00	7.49	37.00
349.	0.0	6.44	X
350.	18.30	7.66	X
351.	X	8.17	X
352.	11.00	7.77	X
353.	0.0	7.28	7.00
354.	28.30	5.86	31.33
355.	7.00	6.98	12.00
356.	11.30	8.48	0.0
357.	3.30	8.25	X
358.	0.0	6.70	X
359.	66.60	8.43	X
360.	51.60	7.50	X
361.	0.0	6.87	X
362.	7.30	7.72	X
363.	0.0	6.87	X
364.	0.0	6.68	X
365.	28.30	7.32	X
366.	26.60	9.60	X
367.	0.0	9.19	X
368.	6.60	8.78	0.0
369.	33.30	7.30	X
370.	0.0	9.05	50.00
371.	70.30	7.93	38.00
372.	35.00	8.31	X
373.	15.60	8.99	27.00
374.	0.0	7.54	X
375.	0.0	9.68	X
376.	20.00	9.03	15.33
377.	16.60	8.78	4.00
378.	0.0	7.93	X
379.	7.00	10.09	16.00
380.	4.60	9.72	0.0

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
381.	11.60	9.38	X
382.	X	9.06	14.33 *
383.	26.60	8.97	X
384.	11.60	8.82	X
385.	22.00	7.43	X
386.	0.0	9.39	X
387.	15.00	7.94	X
388.	0.0	8.88	X
389.	20.60	7.57	X
390.	0.0	7.34	X
391.	18.30	8.73	44.00
392.	0.0	7.99	X
393.	21.60	7.96	X
394.	25.30	8.72	X
395.	36.60	7.59	X
396.	20.00	9.25	X
397.	26.60	6.71	X
398.	21.60	8.03	X
399.	X	7.35	X
400.	46.60	7.75	X
401.	48.30	7.56	24.33
402.	43.30	8.01	31.33
403.	25.00	8.39	X
404.	34.30	7.86	19.00
405.	39.30	7.76	X
406.	X	8.87	X
407.	68.30	7.47	X
408.	26.60	7.11	16.00
409.	26.30	8.43	X
410.	0.0	7.35	X
411.	16.30	7.30	X
412.	61.60	7.55	X
413.	23.30	8.45	26.00
414.	0.0	7.79	X
415.	30.00	7.49	X
416.	6.60	9.02	0.0
417.	0.0	7.24	X
418.	23.60	7.50	X
419.	26.60	7.07	X
420.	20.30	9.00	21.00
421.	0.0	7.22	7.00
422.	78.30	7.21	X
423.	0.0	8.52	X
424.	28.30	6.77	X
425.	0.0	8.88	X
426.	18.00	7.62	22.00
427.	0.0	7.44	X
428.	73.30	6.96	X

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
429.	73.30	7.77	9.00
430.	0.0	7.80	X
431.	12.00	6.94	X
432.	X	7.16	X
433.	X	X	X
434.	14.30	18.13	X
435.	0.0	7.47	X
436.	24.00	9.00	X
437.	25.00	9.30	34.00
438.	0.0	7.15	X
439.	35.00	7.41	X
440.	27.30	8.74	X
441.	46.60	8.12	X
442.	55.00	6.66	13.33
443.	56.30	8.24	X
444.	27.30	8.74	X
445.	0.0	8.22	X
446.	0.0	8.39	X
447.	0.0	8.25	X
448.	0.0	9.63	X
449.	0.0	7.55	X
450.	X	8.61	X
451.	X	X	X
452.	X	X	X
453.	X	-	X
454.	38.30	8.77	X
455.	0.0	8.67	X
456.	X	X	X
457.	27.30	7.86	15.66
458.	7.30	2.83	X
459.	31.60	2.83	X
460.	0.0	1.44	X
461.	20.0	8.08	10.00
462.	15.00	8.05	0.0
463.	16.00	6.72	X
464.	10.30	7.63	X
465.	17.30	9.16	X
466.	8.30	8.30	X
467.	17.30	8.38	X
468.	28.00	8.13	8.00
469.	15.00	7.66	X
470.	15.30	8.52	X
471.	12.60	8.11	31.00
472.	24.30	8.10	X
473.	12.60	9.66	X
474.	15.00	9.19	X
475.	X	7.69	X
476.	18.30	8.38	X

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
477.	53.30	7.89	X
478.	31.60	7.63	X
479.	18.00	7.85	17.00
480.	X	9.11	X
481.	33.00	8.71	X
482.	X	X	
483.	0.0	7.97	X
484.	0.0	8.95	X
485.	10.30	X	0.0
486.	23.00	8.19	X
487.	11.00	8.63	X
488.	6.00	7.74	X
489.	11.30	9.11	24.00
490.	19.60	7.82	21.00
491.	18.30	9.05	X
492.	12.60	9.38	X
493.	11.00	8.27	18.00
494.	0.0	8.38	28.00
495.	63.30	7.44	36.00
496.	63.00	8.30	X
497.	26.60	10.16	X
498.	37.60	7.94	X
499.	22.30	9.27	X
500.	18.60	9.66	X
501.	X	X	X
502.	30.00	7.66	X
503.	27.30	8.49	X
504.	0.0	8.55	16.00
505.	25.30	8.52	46.00
506.	16.00	8.49	16.66
507.	12.30	7.61	0.0
508.	46.60	8.11	X
509.	22.60	8.41	X
510.	52.30	8.41	26.00
511.	63.30	9.25	X
512.	0.0	7.77	X
513.	0.0	9.66	X
514.	15.00	8.66	0.0
515.	7.30	8.49	X
516.	24.60	8.91	X
517.	13.00	8.94	31.00
518.	10.00	8.74	22.00
519.	12.00	7.97	X
520.	12.00	6.96	45.00
521.	17.00	9.61	16.66
522.	0.0	9.80	X
523.	6.00	9.52	0.0
524.	0.0	8.57	X

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
525.	0.0	7.69	X
526.	0.0	8.63	X
527.	32.30	8.16	33.00
528.	25.00	8.02	35.00
529.	46.60	8.72	13.33
530.	40.00	8.74	X
531.	17.30	9.83	11.66
532.	15.00	9.10	X
533.	24.30	8.27	X
534.	17.30	8.49	16.00
535.	13.30	8.69	X
536.	24.00	8.10	X
537.	27.00	4.14	11.00
538.	35.00	81.6	22.00
539.	26.00	7.58	X
540.	32.30	9.27	45.00
541.	12.60	9.16	X
542.	8.00	9.16	X
543.	19.60	9.11	X
544.	7.60	8.94	X
545.	9.00	8.66	25.00
546.	25.00	8.32	X
547.	27.30	9.19	11.433
548.	42.30	8.94	27.00
549.	35.60	9.60	39.00
550.	43.30	8.13	23.00
551.	0.0	8.36	19.00
552.	0.0	9.77	X
553.	28.30	9.16	X
554.	36.60	8.80	X
555.	33.30	7.99	X
556.	35.00	8.55	X
557.	33.30	10.22	X
558.	12.60	4.00	0.0
559.	41.30	9.05	X
560.	31.60	8.99	X
561.	25.00	8.55	X
562.	16.60	9.19	0.0
563.	56.60	8.97	X
564.	53.30	8.86	X
565.	36.60	8.82	X
566.	31.60	9.27	X
567.	41.60	8.16	X
568.	58.30	9.02	31.00
569.	53.30	10.56	X
570.	0.0	9.66	X
571.	32.30	9.41	X
572.	28.30	9.22	X

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
573.	20.00	9.25	38.00
574.	0.0	8.77	X
575.	73.30	9.19	X
576.	33.30	10.02	X
577.	53.30	8.99	X
578.	36.00	10.02	X
579.	0.0	8.10	X
589.	53.30	9.55	X
590.	0.0	9.47	X
591.	21.60	8.88	X
592.	0.0	9.10	X
593.	20.00	9.24	11.00
594.	25.60	9.05	29.00
595.	50.00	9.10	X
596.	0.0	10.30	X
597.	56.60	9.02	X
598.	26.00	8.49	22.00
599.	45.00	9.10	X
600.	0.0	8.16	5.00
601.	0.0	10.55	X
602.	55.00	9.61	X
603.	68.30	7.99	20.00
604.	0.0	8.75	X
605.	0.0	9.38	X
606.	0.0	9.29	X
607.	0.0	9.77	X
608.	0.0	8.84	X
609.	0.0	9.71	39.00
610.	28.30	8.67	X
611.	0.0	10.17	X
612.	0.0	8.51	14.00
613.	0.0	11.05	X
614.	26.60	8.401	12.00
615.	35.60	8.74	X
616.	14.60	9.47	14.00
617.	0.0	9.04	X
618.	X	9.67	35.00 *
619.	0.0	10.59	25.00
620.	0.0	8.91	X
621.	51.60	10.55	35.00
622.	66.30	11.60	X
623.	37.30	9.01	25.00
624.	54.30	10.26	X
625.	43.30	9.86	X
626.	30.00	8.09	X
627.	63.30	9.17	5.50
628.	0.0	10.14	17.00
629.	0.0	8.95	15.00

Table 3. (Cont'd).

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
630.	53.30	10.54	15.00
631.	16.30	8.90	0.0
632.	42.30	9.97	16.00
633.	8.30	9.32	31.00
634.	6.60	9.62	X
635.	0.0	8.41	12.00
636.	0.0	9.37	4.00
637.	0.0	8.90	5.00
638.	14.60	9.42	40.00
639.	0.0	9.37	X
640..	0.0	8.07	X
641.	15.60	8.01	X
642.	X	10.28	X
643.	12.00	9.23	X
644.	13.30	8.58	15.00
645.	4.30	10.15	X
646	X	0.03	X
647.	X	9.65	X
648.	X	12.00	22.00
649.	6.60	8.94	7.11
650.	6.30	8.94	7.00
651.	19.00	8.14	23.00
652.	0.0	9.43	42.00
653.	12.60	8.87	27.00
654.	20.30	8.40	13.60
655.	15.00	9.61	X
656.	X	9.17	33.00 *
657.	X	10.36	43.00
658.	15.50	9.97	X
659.	X	3.35	X
660.	13.00	10.39	45.00
661.	X	8.55	X
662.	X	8.57	27.00 *
663.	7.30	8.05	0.0
664.	X	9.68	X
665.	7.30	9.17	X
666.	X	10.58	X
667.	30.00	9.50	X
668.	X	X	X
669.	25.00	9.33	X
670.	X	8.31	X
671.	X	9.91	17.00
672.	X	X	X
673.	X	8.33	X
674.	37.60	11.46	28.30
675.	27.30	10.02	X
676.	X		X
677.	X		X

Table 3.. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
678.	X		X
679.	X		X
680.	X		X
681.	X		X
682.	X		X
683.	10.30		0.0
684.	16.00		X
685.	X		X
686.	25.60		X
687.	25.30		X
688.	25.30		X
689.	21.00		X
690.	24.00		X
691.	6.00		0.0
692.	26.60		X
693.	23.00		X
694.	14.30		X
695.	22.30		X
696.	31.60		X
697.	16.30		7.00
698.	19.00		X
699.	12.00		10.00
700.	14.00		X
701.	X		X
702.	15.30		X
703	15.00		X
704.	14.30		X
705.	15.60		X
706.	25.60		X
707.	16.60		12.00
708.	X		X
709.	16.60		X
710.	45.00		X
711.	30.00		X
712.	X		X
713.	14.30		0.0
714.	X		X
715.	8.00		2.00
716.	19.60		X
717.	56.60		X
718.	0.0		X
719.	X		X
720.	0.0		X
721.	X		X
722.	0.0		X
723.	20.00		0.0
724.	61.60		0.0
725.	X		X

Table 3. Cont'd).

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
726.	24.30		19.00
727.	20.60		19.00
728.	29.00		10.00
729.	0.0		5.00 *
730.	X		X
731.	X		15.00
732.	X		X
733.	X		X
734.	X		21.00
735.	40.30		X
736.	4.00		0.0
737.	32.30		16.00
738.	0.0		X
739.	8.60		X
740.	0.0		19.00
741.	0.0		31.00
742.	0.0		32.00
743.	0.0		20.00
744.	28.30		24.00
745.	0.0		14.00
746.	0.0		0.0
747.	30.00		30.00
748.	0.0		X
749.	3.30		16.00
750.	13.00		23.00
751.	X		X
752.	11.00		7.00
753.	11.00		0.0
754.	20.00		28.00
755.	6.50		X
756.	10.00		17.00
757.	38.30		23.00
758.	35.00		X
759.	X		X
760.	19.00		16.00
761.	21.00		17.00
762.	4.00		9.00
763.	0.0		X
764.	34.30		X
765.	26.00		50.00
766.	18.50		X
767.	20.00		40.00
768.	17.00		X
769.	0.0		X
770.	0.0		51.00
771.	0.0		X
772.	0.0		X
773.	50.00		19.00

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
774.	0.0		7.00
775.	7.30		X
776.	16.00		X
777.	18.30		X
778.	X		X
779.	0.0		X
780.	24.00		X
781.	13.00		11.00
782.	32.00		X
783.	15.00		10.00
784.	18.30		X
785.	7.30		11.00
786.	15.60		10.00
787.	22.60		15.00
788.	0.0		X
789.	75.60		40.00
790.	22.30		X
791.	22.30		48.00
792.	0.0		X
793.	30.00		40.00
794.	28.30		X
795.	X		X
796.	13.60		34.00
797.	30.30		16.00
798.	29.00		10.00
799.	7.00		X
800.	0.0		X
801.	0.0		10.00
802.	8.50		X
803.	21.30		55.00
804.	35.00		34.00
805.	17.50		X
806.	0.0		X
807.	25.30		50.00
808.	15.60		X
809.	20.00		17.00
810.	7.30		X
811.	13.00		34.00
812.	14.60		11.00
813.	28.30		12.00
814.	31.00		11.00
815.	3.00		X
816.	18.00		15.00
817.	14.30		16.00
818.	30.00		8.00
819.	9.00		13.00
820.	26.60		19.00
821.	16.60		46.00

Table 3. (Cont'd)

Germplasm Entry No.	Rampur	Parwanipur	Rampur glass house
822.	20.30		3.00
823.	12.60		5.00
824.	X		X
825.	11.66		X
826.	22.60		X
827.	8.00		X
828.	15.60		X
829.	13.00		X
830.	6.00		X
831.	X		X
832.	6.00		X
833.	15.60		X
834.	20.60		X
835.	23.30		X

NOTE: X SYMBOL INDICATES SEEDLING NOT PLANTED

0.0 SYMBOL INDICATES NO INFECTION OF BLB

T SYMBOL INDICATES THE LATE GERMINATION

ANNEX I. MEMORANDUM OF UNDERSTANDING NO 4.

BETWEEN

DR. A. JOHN DE BOER

WINROCK INTERNATIONAL

INSTITUTE FOR AGRICULTURAL DEVELOPMENT (WI)

KATHMANDU, NEPAL

AND

MR. SUNDAR MAN SHRESTHA

HEAD, DEPARTMENT OF PLANT PATHOLOGY

THE INSTITUTE OF AGRICULTURE AND ANIMAL SCIENCE (IAAS)

TRIBHUVAN UNIVERSITY, MINISTRY OF EDUCATION,

HIS MAJESTRY'S GOVERNMENT OF NEPAL

ACTING PRINCIPAL INVESTIGATOR

PATHOGENIC VARIABILITY OF AND

BACTERIOCIN PRODUCTION PROJECT (PVBP)

This is the fourth memorandum of understanding covering implementation of the Winrock International Grant from USAID/ Office of the Science Advisor for Pathogenic Variability of and Bacteriocin Production by **Xanthomonas campestris pv. Oryzae** in Nepal (PVBP Project). This fourth memorandum of understanding is needed due to lack of required budget for shipment clearance, custom duties, transportation cost and over expenses made to procure the equipment. This MOU is also needed to reallocate additional funds to line item VI.(Other direct costs), due to small over expenditure on green house construction.

The two parties mentioned above have reached agreement on the following points:

Article I

Winrock International will revise the original contract budget as stated in the following paragraphs and justification given below:

A. Line item II. Equipment: Amount is over expended under this line item as shown below:

1. Equipment	US $ 6347.00
2. Shipping and clearing from India (estimate)	US $ 2000.00
3. Custom duties @ 15% on about US $25,000.(estimate)	US $ 3750.00
4. Future needs	$ 1903.00
Total	US $ 14,000.00

B. Line item VI.Other direct costs.

The total amount spent up to now is US $ 15,162.00 while the original estimate was US $ 14,300.00. The deficit amount under this item is US $ 862.00. The present estimate for future expenses for telex, paper etc. is US $ 836.00 Total additional funds needed for this item is US $ 1700.00.

C. Line item V. Travel and Per diem:

Since there is no need for collaborator's travel and International consultant's travel for a period of 1 year, US $ 5000.00 will be transferred to line item II.Equipment.

2. Salaries and wages:

Since the consultation is not required from International consultants for the project duration, the amount of US $ 9,000.00 will be transferred to line item II.(Equipment) and $ 1700.00 will be transferred to line item VI.(Other direct costs).

The original contract budget and revised budget resulting from MOU No. 4 are attached as Tables 1. and 2.

This memorandum of understanding is signed in Kathmandu on September_____, 1988.

Signed in _____, in original.

Date_____

_____
Dr. A. John De Boer
Winrock INternational
Institute of Agricultural Development

_____
Mr. Sundar Man Shrestha
Acting Principal Investigator
PVBF Project

Witness _____
Krishna Khanal
Administrative Specialist

Table 1.

SUMMARY OF BUDGET CHANGES MADE UNDER MOU NO. 4

	Old budget	New budget
I. Salaries and wages	$ 46,470.00	$ 35,770.00
II. Equipment	$ 22,300.00	$ 36,300.00
III. Training	$ 3,600.00	$ 3,600.00
IV. Consultation	$ 4,500.00	$ 4,500.00
V. Travel & Per diem	$ 15,000.00	$ 10,000.00
VI. Other direct cost	$ 14,300.00	$ 16,000.00
Total direct cost	$ 106,170.00	$ 106,170.00
VII. Winrock management fee	$ 13,830.00	$ 13,830.00
Total	$ 120,000.00	$ 120,000.00

Table 2.

ORIGINAL BUDGET OF PVBP PROJECT

GRANT BUDGET IN CONTRACT DATED APRIL 30, 1987.

COST ELEMENT	AMOUNT
I. Salaries and wages	$ 46,470.00
II. Equipment	$ 22,300.00
III. Training	$ 3,600.00
IV. Consultation	$ 4,500.00
V. Travel & Per diem	$ 15,000.00
VI. Other direct cost	$ 14,300.00
Total direct cost	$ 106,170.00
VII. Winrock management fee	$ 13,830.00
Total	$ 120,000.00

PVBP GRANT BUDGET STATUS

AUGUST 16 STATEMENT COVERING JULY 1988.

Table 1.

Amount over expended

1.	Equipment	US $ 6347.00
2.	Shipping and clearing from India	US $ 2000.00
3.	Custom duties @ 15% on about US $ 25000.00 shipment	US $ 3750.00
	Total	US $ 12,097.00

Transfer $ 14,000.00 to this line item to cover future expenses.

2. Other direct costs.

US $ 15,162.00
\- US $ 14,300.00
US $ 862.00

Add on another $ 838.00 for future expenses for telexes, paper, etc. So new amount will be $ 16,000.00 total to be transferred to this line item is $ 1700.00

Suggestions

1. Transfer $ 5,000.00 from travel and Per diem to Equipment.
2. Transfer $ 10,700.00 from Salaries and wages to Equipment ($ 9,000.) and other direct cost ($1700.)