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INSTITUT SENEGALAIS DE RECHERCHES AGRICOLES
I.S.R.A.

TRAINING REPORT

(Training from March 16th to November 22th
1985 at **I .C.R.I.S.A.T.** Patancheru, India)

BY

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FORWORD

The traininq effected at I.C.R.I.S.A.T. from Mat-ch 16th to November 22th 1985 is very benef icial because of the new knowledge qot in plant protection ,breedinq and statistics and the learnt of workinq in computer.This was possible account of the 2 months spent at Osmania Universi ty to learn Enqlish wich i s used a t ICRISAT.

It would be monotonous if the traininq office didnt provide various proqram by trips in technical and touristics places.Hence the trips in the states of Maharastra,Tamil Nadu, Karnataka and Hndra Pradesh helped us to beat the home sick wich could disturb the training.Besides these trips permited us to see there are diversities between the states in this qreat contry t h a t is India .The tradi tional and modern technoloqi es of agriculture change from one çtate to another,one district to one another or some time within state or district.

Finely the trips sow us how i t is possible for the Semi krid Tropics(S.AT.) farmers to diversify the crop production by adoptinq plants wich are known as wild.

Also a certain number of overviews gave us a qeneral knowledge on a large specter of domain:economi ics,socıology, breedi nq and plant protection,physiology,pathology and man an gemen t.

The ser ies of lectures reminded beneficialy the qenetics, statistics and agricultural experiments,research manangemen t and soif physics.

All this overviews,lectures and trips would be not beneficial i f experimentaltria1s were not conducted to see the practice in the field and in the laboratory.

Thus trials o n pigeonpea insects resistance ,pigeonpea varıetal trial,piqeonpea international yield tria1 , antilbiosis studies of Heliothis armigera on piqeonpea selections and the survey of pheromone trap were conducted.

One may ask why these trials on piqeonpea at the place of cowpea(Vigna unguiculata) ,crop ın wich our works are mainly concen tratred ın Senegal?Indeed we would be very qlad tu conduct trials in cowpea entomology to improve the knowleqde and technics in this crop.But ,as every body know, ICRISAT has only 5 mandated crops in wich the crop improvement proqram is working.There for i t would be not beneficial to conduct tria1 with cowpea wich ıs not includ ın these 5 crops.Thats why we cannot put a stop to thank the Training Program Officers who helped us in the choice of the subject and in all the manangements during the traininq.

we are grateful to Dr Oswalt for all,specialy for the daily help in the learnt to work ın the computer and Dr F.Singh for his daily advices.

we cannot put a stop also to thank the personal of Pulses entomology who maked the training more benef icial by their advices, their lectures and the training in the field and in the laboratory .

we are grateful to Drs Reed, the Principal entomologist, Lateef, Sithanantham, Dent, Pawar and all the fields and laboratory technicians in Pules entornology for their daily help.

Finely, some time was cpent to learn to work in the computer, Hence, this report and some data analysis are done through the computer.

Diop (Senegal) monitoring Heliothis populations in pigeonpea

INTRODUCTION

As it is known, ICRISAT is created to help national programs in the manangement of crop production by creeting new varieties wich are resistant to drought and pests and give high grain yield.

Thus at I.C.R.I.S.A.T. thiç year, the deficiency of rainfall was much impur tant speci aly for the early maturing genotypes account of the fact the flowering stage coincide wi th this deficiency. The graph Nul let us see the fluctuation of the rainfall and data taken in the field(pigeonpea international. yield trial) sow us the effect of this on crops. The critical of the crop(flowering)for the medium early varieties was at the end of August and the begining of September. The rainfall deficiency compared to last year is lower of 19% for the period June 1st to October 15th. Plus, at the flowering stage, the deficiency is about 69%/1984 rainf all ,

Also at this stage ,as we can see through the graphs of Heliothis armigera, the of this insect was high and influenced the pipeonpea production.

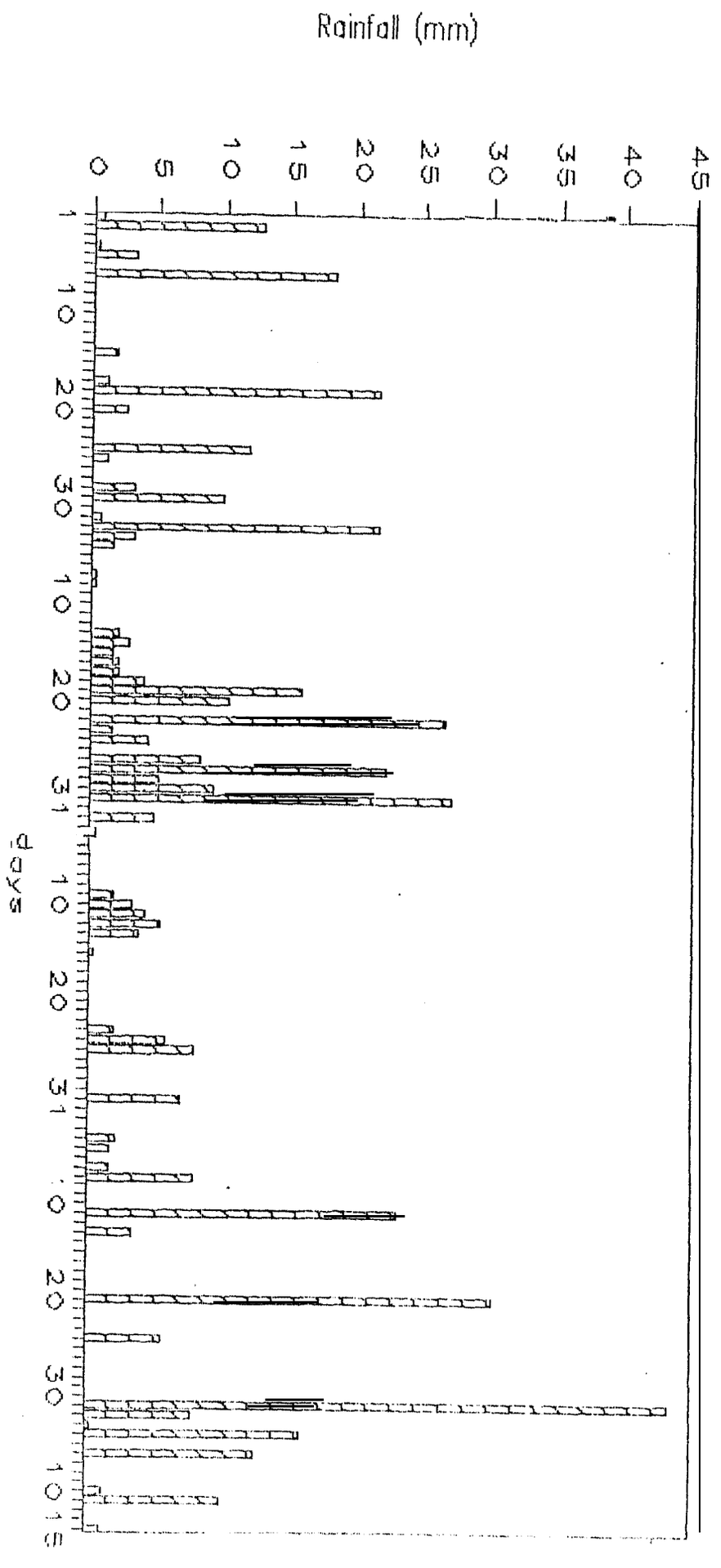
For all these problems it is necessary fur the S.A.T. scientists to see how it is possible to find methods wich can help farmers in the crop production management.

Legumes ,among them Ca janus ca jan wi ch con tei n about 20% of prùtein merit our attention. For 2.82 ha, pigeonpea give 1.33 tonnes/year. Account of the hvman food def iciency, it is then necessary to protect this crop against the specter of insects wich reduce the yield. It is the objective of these trials.

GRAPH 1

ICRISAT RAINFLL 1985

1JUNE TO 15 OCTOBER



PIGEONPEA TRIALS AND HELIOTHIS ARMIGERA STUDIES

Pigeonpea(Cajanus cajan) is a papilonceum wich is grown through the wold and rnainly in India.This pule wich is important iri food productiun by the proteins,minerals and vitamins content ,know many pest damage.The most important diseases are the wilt and the sterility rnosaic wich can reduce cunsiderably the production specialy the late varieties(for the wilt).The most important insects are Heliothis armigera,Melanogromyza obtusa, Cydia(Eucosma)critica,Maruca testulalis,Tanaostigmodes cajaninae.

The following list give the major insect pest of pigeonpea.

LIST OF THE MAJORINSECT PESTS OF PIGEONPEA IN INDIA

TABLE 1

	PEST GROUP	SCIENTIFIC NAME	COMMON NAME
1		Phyllobius sp.	Leaf weevils
2		Gonocephalum dorsogranosum	Soi 1 beetle
3	Seeling pests	Alicides spp.	Stern weevils
4	and	Myllocerus spp.	Leaf weevifs
5	defoliators	Ophiomyia centroçematis	Stem fly
6		Megachile spp.	Leaf cut ter bees
7		Caloptilia soyella	Leaf roller
8		Cydia(Eucosma)cretica	Leaf tier
9		Amsacta albistriga	Hairy caterpiller
10		Diacrysia(Plusia)orichalcea	Semilooper
11		Colemania sphenerioides	Deccan winyless
12			grasshopper
113			
14		Ceuthorrhynchus asperulus*	Bud weevil
15		Mylabris pustulata*	Flower beetle
16		Euproctis subnotata	Hairy caterpiller
17		Lampides boeticus*	Blue butterflies
18		Catochrysops strabo	" "
19	Bud/flowers	Heliothis armigera*	Tur pod borer
20	pests	Exelastis atomisa	Plurne moth
121		Campylomma livida	Bugs
22		Creontiades pallidus	Bugs
23		Megalurotrhips usitatus	Flower thrips
24		Taeniothrips nigricornis	" "
25			
26		19*,20*,8*,17*	
27		Maruca testulalis*	Pod borer
28	Lepidopteran	Etiella zinckenella*	" "
29	pod borers	Adisura atkinsoni	" "
31		A.marginalis	" "
32		18	
		Sphenarches anisodactylus	Bean plume moth
33	Dipteran	Melanagromyza obtusa*	Pod fly
	seed borer		
34		Apion benignum	Seed weevi l
35	Coleopteran	Callosobruchus chinensis*	Bruchids

136	pod and	C.maculatus*	"
137	seed borer	C.theobrome*	"
138	Hymeopteran pod borers	Tanaostigmodes cajaninae*	
139		Clavigralla gibbosa*	Tur pod bug
140		C.scutellaris	" " "
141		Nezara viridula	Stink bug
142	Hemipteran	Dolicoris indicus	" "
143	pests	Anoplocnemis sp.	Bugs
144		Oxyryhachis tarandus	Cow bug
146		Aphis craccivora	Aphids
147		Amrasca spp.	Leaf hoppers
148		Cicadella spectra	Leaf hoppers

*Insects found to be the major pests in many areas.
Source:Dr.s.s.Lateef

LIST OF **INSECTS** RECORDED **AS** MAJOR PESTS ON PIOEONPEA IN OTHER **CONTRIES** BUT NOT RECORDED IN **INDIA**

TABLE **2**

SCIENTIFIC **NAME**	COMMON **NAME**	CONTRY
Empoasca fabilis	Jassids	Trinidad
Oncides amputator	Flower beetle	Tanzania
Mylabris arnplectens	"	"
M.aperta	" "	Kenya
Coryna apicicornis	" "	"
Acanthoscelides erythraeus	seed beetle	"
Aulacophora foveicollis	Pollen beetle	"
Epicauta sp.	" "	"
Heliothis zea	Pod borer	Caribbean
H.virescens	" "	Peru
Elasmopalpus rubedinellus	" "	Caribbean,Peru
Ancylostomia stercorea	" "	Tanzania,Trinidad,Peru
Pardasene vi rgulana	" "	Kenya
Melanagromyza chalcosoma	Pod fly	"
Acanthomia horrida	Pod bug	Tanzania,Kenya
A.tomentosicollis	" "	",Nigeria, "
Microtermes sp.	Termites	Kenya
Allondotermes sp.	"	"
Cerococcus catenorius	Scale insects	Nigeria

Source :Dr.s.s.Lateef

1-PIGEONPEA TRIAL FOR INSECT RESISTANCE

OBJECTIVES: Evaluation of pigeonpea insect pest and the susceptibility of some genotypes.

MATERIAL AND METHODS

GENOTYPEÇ: BDN-1 , ICP 1691 , PPE 45 2 , ICP 1903-E1
ICP 10466 , ICPL 84060 , ICP 7203 , ICP 909
REPLICATIONS: 3
DESIGN : RBD
PLOTS SIZE: 3MX5M INTO 2 BEDS OF 4 ROWS EACH(0.75M BETWEEN ROWS AND 20CM BETWEEN PLANTS. GROSS AREA=15M^2, NET PLOT=4.5M^2.
THINING: DONE ON 9/7/1985.

Characters like days to 50% flowering, plant height at flowering and weekly insects counts (Heliothis armigera: eggs and larvae, webs, bugs, beetles) were reccorded.

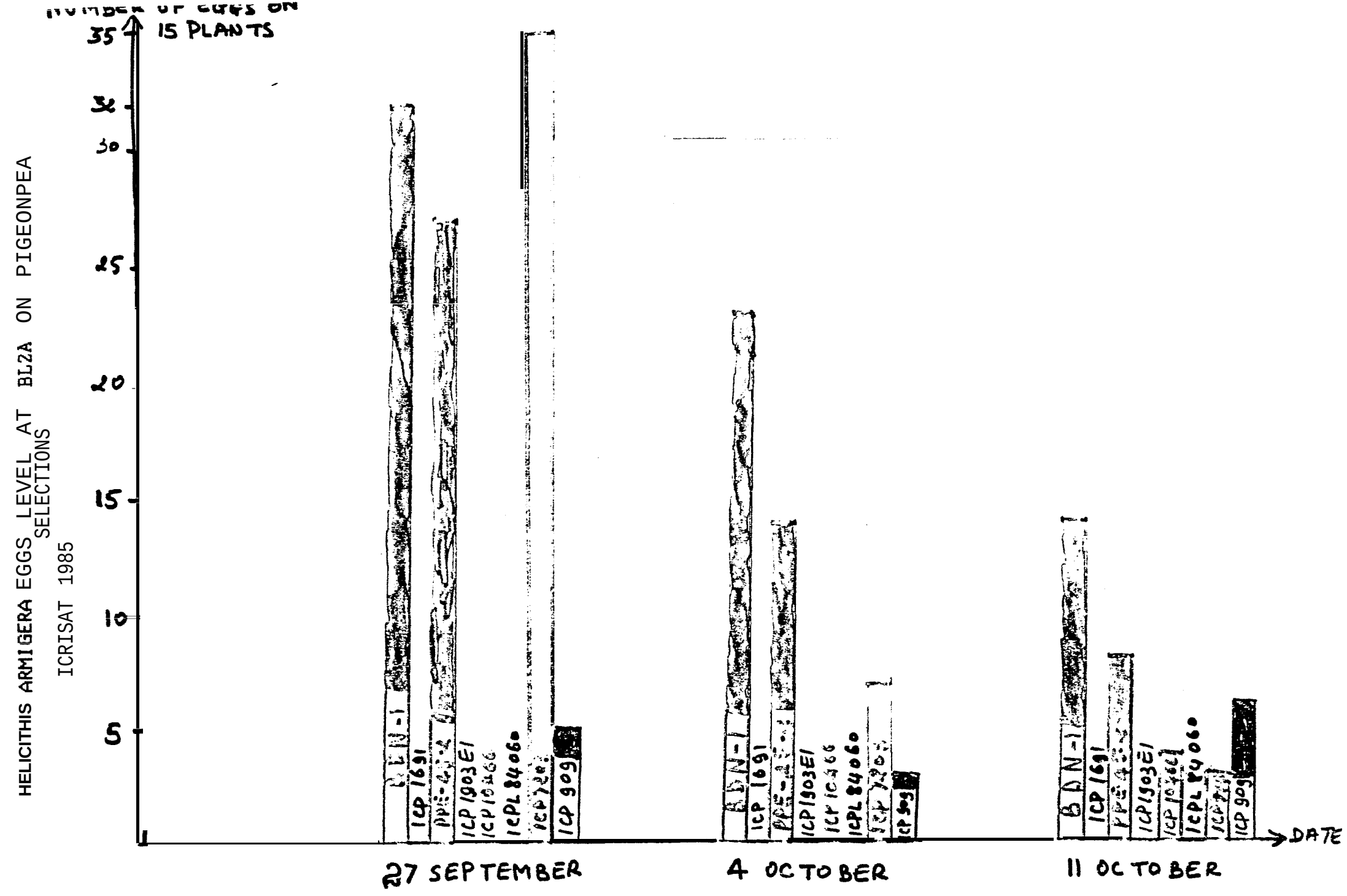
This tria1 is not yet finished and at harvest characters like damaged pods by Heliothis armigera , hemynopterian group, pod fly and bugs will be reccorded.

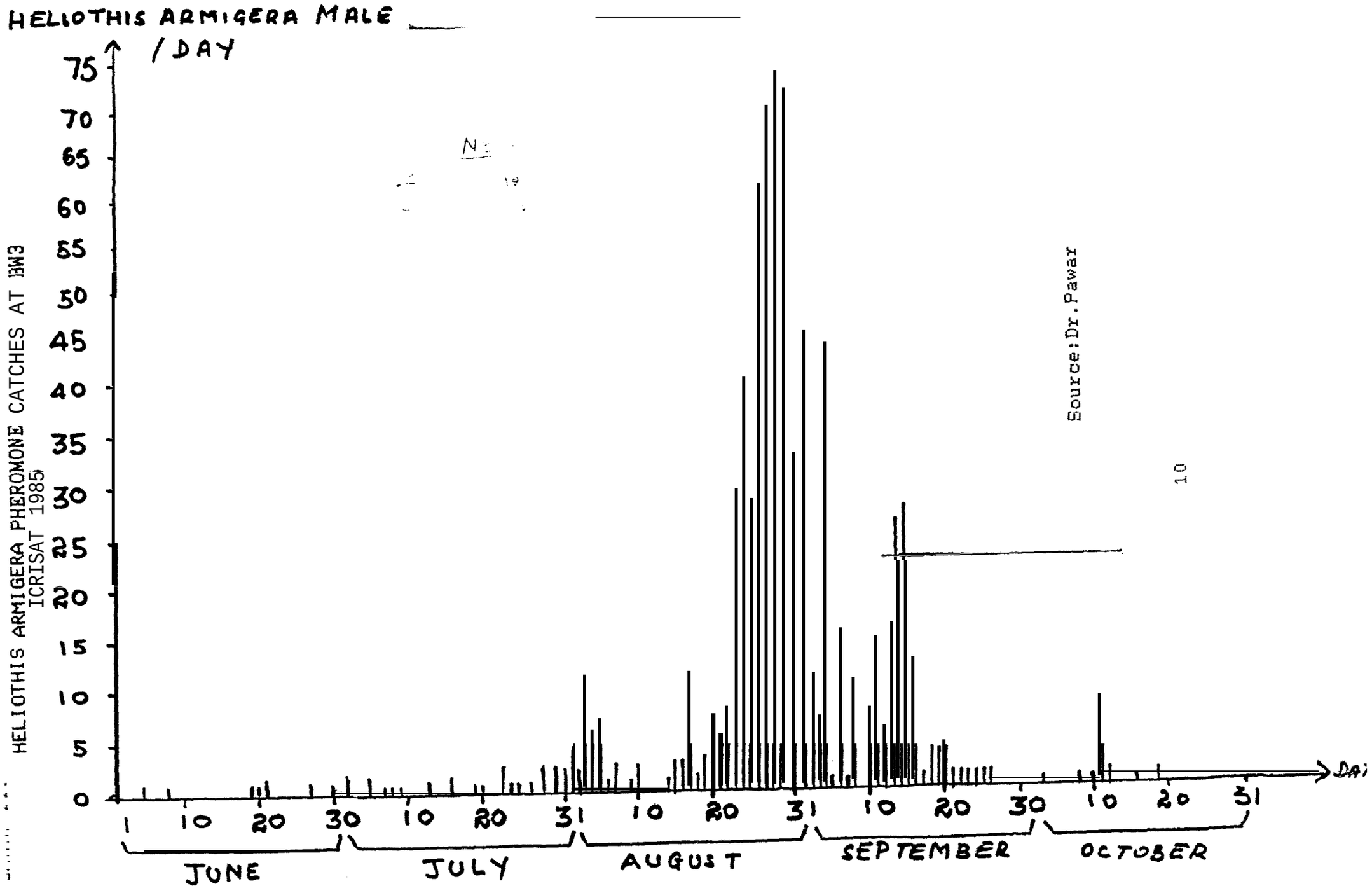
RESULTS AND DISCUSSIONS

TABLE 3

TREATMENTS	50 % FLOWER (days)	PLANT HEIGHT (cm)	WEBS 1 COUNT (/5plants	HELIOTHIS ARMIGERAI (3 COUNTS/5PLTS EACH) EGGS	LARVAE
BDN-1	117	14.1	19	23	2
ICP 1691	122#	169	13-	0-	2
PPE-45-2	102	162	17	13	1
ICP 1903 El	121	172#	24#	0-	0-
ICP 10466	121	16'8	17	1	0-
ICPL 84060	120	167	13-	0-	0-
ICP 7203	94-	14.0	22	12	6#
ICP 909	103	138-	13	5	0-
SEM (+-)	3.62	3.42	8.03	6.87	1.73
C.V. (%)	6	4	47	102	122
F REPS	2.60	0.69			
F VARIETIES	9.12**	18.43**	4.64**	3.96-k	1.00(NS)

In this experiment, the early varieties were more damaged by Heliothis armigera. It is because the level of this insect was very high at the flowering stage of these varieties (BDN 1, ICP 7203, ICP 909 and PPE-45-2). In this case, PPE-45-2 known as a resistant , show high level of eggs and larvae if we considere others. The later varieties like ICP 10466, ICP 1903 El, ICPL 84060 show less attactency.


HELICITHIS ARMIGERA EGGS LEVEL AT BIZA ON PIGEONPEA
SELECTIONS
ICRISAT 1985
NUMBER OF EGGS ON 15 PLANTS
35
30
25
20
15
10
5
1
BDN-1
ICP 1691
ICP 1903E1
ICPL 84060
ICP 909
DATE
27 SEPTEMBER
4 OCTOBER
11 OCTOBER


HELIOTHIS ARMIGERA MALE
/DAY
HELIOTHIS ARMIGERA PHEROMONE CATCHES AT BW3
ICRISAT 1985
Source: Dr. Pawar
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
1
10
20
30
10
20
31
10
20
31
10
20
30
10
20
31
JUNE
JULY
AUGUST
SEPTEMBER
OCTOBER

The post harvest data will give much informations about the behevour of the genotypes under these conditions.However we can see the influence of the sowing date according the cycle of the plant.According to the graphs 11,111 and IV,it would be recommanble to suggest to the farmer to coincide the flowering stage at the end of September and begining of October where the level of Heliothis armigera is low.No dought,the plant height,days 50% flowering and the level. of damage are related in this case.Even if the level of webs is very high,this insect(Cydia cretica) didnt taken our attention because the damage are influcing much the yield.

This experiment should be done again to confirm the results and it will interessing next year to add 3 or 4 date of sowing to see how will be the behevour of these genotypes.

II-EARLY MATWRING PIGEONPEA VARIETAL TRIAL

OBJECTIVES:compare Pigeonpea selections under minimum treatments of pesticides at Patancheru(India,Kharif 1985)

MATERIAL AND METHODS

GENOTYPES: ICPL4 ,ICPL317 ,ICPL151 ,ICPL87 ,ICPL315 ,ICPL8311
REPLICATIONS :4 DESIGN : RBD
PLOTS SIZE:3MX5M INTO 2 BEDS OF 8 ROWS EACH(0.375 CM BETWEEN ROWS AND 10 CM BETWEEN PLANTS.GROSS AREA=15 M^2,PLOT NET=4.5M^2.
FERTILIZER :20-17-00
INSECTICIDE:2 Treatments(23/8,13/9)with Endosulfan were applyed.
WEEDING :3 MANUAL (2/7 , 17/7 , 22/8/1985) WERE SUFFISANTS.
IRRIGATION: NIL
DATE OF SOWING:19/6/1985
THINING:DONE ON 9/7/1985

Characters like days to 50% flowering,plant height at flowering,plant stand at harvest,yield,100 seeds weight and percentage of grain were reccorded.

RESULTS AND DISCUSSIONS

TABLE 4

TREATMENTSI	50 % FLOWER (days)	PLANT HEIGHT (cm)	IPLANT STAND (000/ha	GRAIN YIELD (Kg/ha)	1100 SEEDS WEIGHT (g)	THRESHING (%)
ICPL 4	72-	82	293#	781	6-	67
ICPL 317	79	82	237-	676	7	70#
ICPL 151	77	85#	239	898#	9#	69
ICPL 87	85#	75	263	509-	9#	61-
ICPL 315	72-	84	247	687	7	66
ICPL 8311	77	85#	262	764	8	68
SEM(+-)	1.85	2.85	19.81	145	0.23	2.55
C.V. (%)	5	7	15	40	6	8
F REPS	2.77	2.110	0.23	3.01*	2.22	2.77
F VARIETIES	6.51**	1.861	1.11	0.83	28.14**	1.15

We can notice through the previous table than the difference is not significative in plant height,in plant stand ,grain yield, and threshing percentage.The field was very"homogenious".
The following graphs sow how the difference is significative.

50% flowering:

Genotypes	v4	v2	v6	v3	v1	v5
Days	85	79	77	77	72	72

100 seeds weight:

Genotypes:	V3	V4	V6	V5	V2	V1
grams :	8.5	8.5	8.3	7	6.5	5.5

In grain yield the difference is significative at 5%.Indeed during this season,the field show some heterogenious places specialy in the 3rd replication.This influenced highly the of 3 genotypes.The ICPL 87 is much lower than others.The results must be confimed next year.

III-PIGEONPEA INTERNATIONAL YIELD TRIAL

OBJECTIVES:as for the early maturing pigeonjpea varietal trial,this international yield tria1 has as purpose the comportment of some pigeonpea .More in this tria1 16 pigeonpea are involved and it is compound of 2 types of maturing varieties: extra early maturing and medium.

GENOTYPES

EXTRA EARLY MATURING TYPES

ICPL 4 , ICPL 151 , ICPL 87 , ICPL 289 , ICPIL 312 , ICPL 316 , ICPL 146 , ICPL 155 , ICPL 8311 , ICPL 8324.

MEDIUM TYPES

ICPL 1 ,ICPL 6 ,ICPL 81 ,ICPL 161 , ICPL 288 , ICPL 269

REPLICATIONS:3
DESIGN :RBD
PLOTS SIZE : 3mx5m into 2 beds of 8 rows each(o.375 cm between rows and 10 cm between plants.Gross area =15m^2,net plot=4.5m^2.
DATE OF SOWING:25 /6 1985(resowing ICPL 8324 On 16 /7/1985)
FERTILIZER:20-17-00
INSECTICIDE TREATMENTS:2 on 23/8 AND 13/9 1'385 with endosulfan(Thiodan) were applyed.
WEEDING:done on 11/7,7/8/1985.
THINING:DONE ON 18/7/1985.
In this tria1 the data reccorded are : days tu 50% flowering,plant height,100 seeds weight,grain yield (2 harvests),and percentage of grain.

RESULTS AND DISCUSSIONS

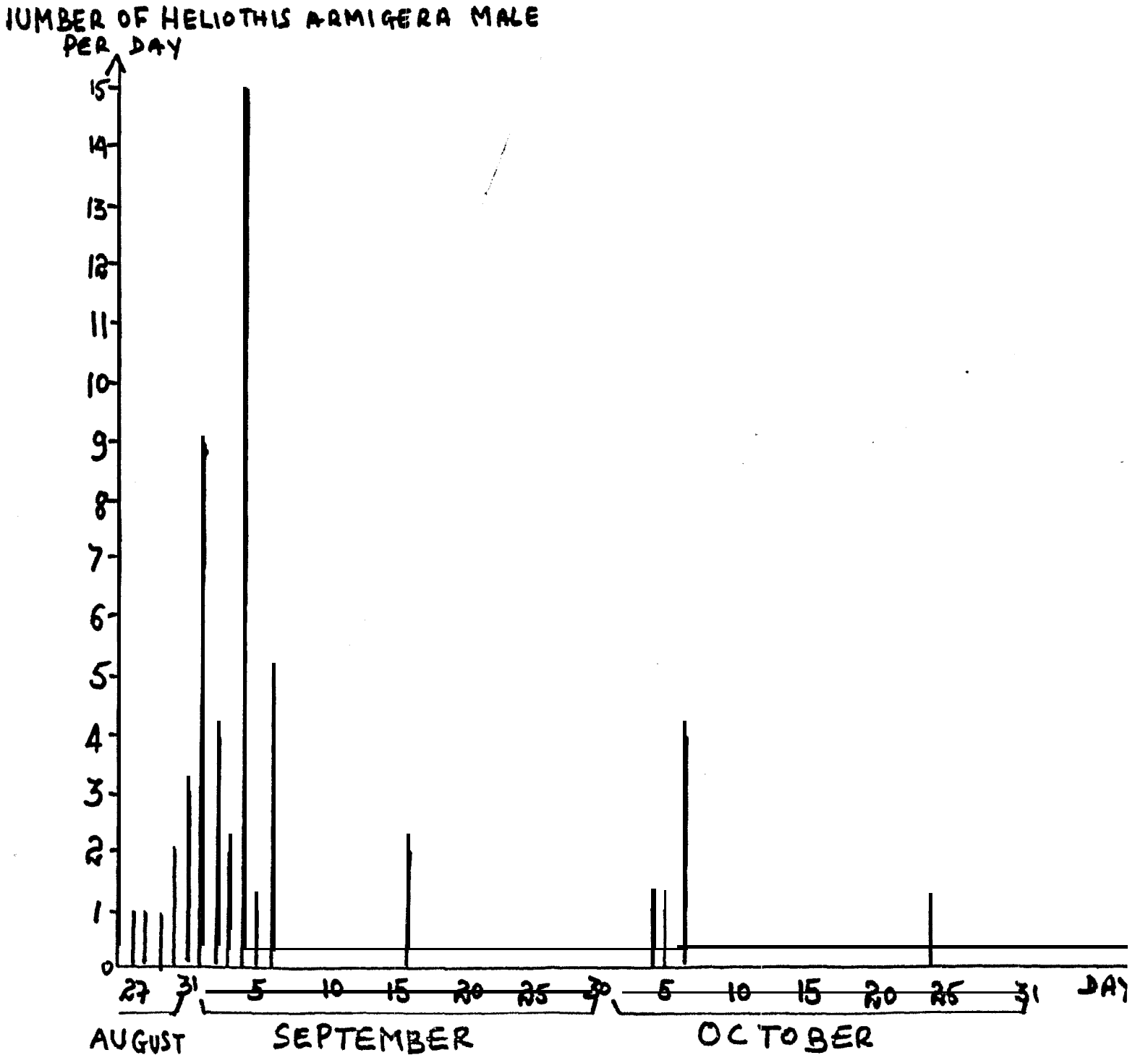
TABLE 5

TREATMENTS	50% FLOWER (days)	PLANT HEIGHT (cm)	GRAIN YIELD 1ST (Kg/ha)	GRAIN YIELD 2ND (Kg/ha)	GRAIN YIELD TOTAL (Kg/ha)	1100 SEEDS WEIGHT (g)	THRESHI (%)
ICPL 4	60	81	513	1125	738	6 -	56
ICPL 151	64	82	1751	46	797	10	66
ICPL 87	68	75	219	478	696	11	64
ICPL 289	62	65-	1743	44	786	10	64
ICPL 312	61	67	657	15	672	11	62
ICPL 316	50 -	71	1565	1228	793	8	61
ICPL 146	66	79	1414	1991	513	9	59
ICPL 155	71	88	1221	1536	757	9	72#
ICPL 8311	64	84	799#	41	840	10	67
ICPL 8324	69	81	206-	71	277	14#	54-
ICPL 1	1 65	83	1524	34	558	8	67
ICPL 6	73	92 #	1347	1323	669	9	60
ICPL 81	63	81	1601	10	611	7	63
ICPL 161	61	76	1602	26	628	9	58
ICPL 288	74#	89	1207	98	305	9	57
ICPL 269	66	86	593	22	616	10	66
SEM (+-)	10.82	2.98	1116	55.2	122.16	0.33	3.25
C.V. (%)	12.18	6	41	70	33	6	9
F REPS	1	2.67	0.53	0.88	0.891	1.52	3.29
F VARIETIES	50.5**	6.75**	3.1**	9.17**	1.81	9.27**	2.18*

As said in the begining,this year the rainfall very deficient and the fatal drought of August wich coincided with the flowering stage affected much this tria1 specialy the medium early varieties.The data were very irregular and it is not possible to withdraw one conclusion in this conditions.We can only notice the performance of ICPL 8311,ICPL 151,ICPL 289 and the yield of the medium early varieties specialy the check ICPL 87.

"RAPH IV

HELIOTHIS **ARMIGERA** PHEROMONE CATCHES AT **RCW13B** ON
PIGEONPEA INTERNATIONAL YIELD TRIAL
ICRISAT 1985



TRAINING PROGRAM IN PULSES ENTOMOLOGY

From August 26th ta 19 November 1985,the time was mainly used for training in ICRISAT Pulses entomology laboratory,

The program learnt were:
Introduction:pest of pigeonpea
Pigeonpea field observation,pheromone trap installation.
Numbering of plants/pheromone trap catches.
Observations of pests/pests counts in the trial.
Parasites/predators of the pests of pigeonpea and chickpea.
Pheromone trap studies.
Light trap stidies.
Pesticide applications and problemç in farmers field.
NPV in Heliothis and its use as a biological agent.
Biology of pests of pigeonpea.
Integrated pest control in pigeonpea.
Host plant resistance to pests.
Pratical aspects and problems of pests control.
Methodology of pests resistance screening.
Rearing of parasites.
Field experimentation and statitical designs.
Pod damage assessments in pigeonpea.
Statistical analysis of data.

ANTIBIOSIS STUDIES OFHELIMHIS AMIGERA ON PIGIEONPEA

To know the effect of resistant varieties on the growth and life of Heliothis armigera and see how the antibiosis could be used in Integreted Pest Mananement(IPM),this tria1 is conduzted with the help of Drs Reed and Lateef of the Pules entomology program.

MATERIAL AND METHODS

Larvae hatched on 14 September are reared in laboratory condition5 in "Percivial"incubator:

-Temperature :28C+-1C
-Relative Humidity :70%
-Light :12 hours

Replications :10
Treatments :7 mixed with general articial diet.

1)A=dhal of ICP 1903 E1(reistant to Heliothis armigera)
2)B=wole seed of ICP 1903 El
3)C=dhal of PPE 50(medium resistant to Heliothis armigera)
4)D=whole seedof PPE 50
5)E=dhal of ICP 1691(susceptible to Heliothis armigera)
6)F=whole seed of ICP 1691
7)G=dhal of Khabuli seed(chickpea susceptible) as a check.

COMPOSITION OF THE BASIC ARTICIAL DIET

1)Flour of tested material(+water)	75g	
2)Ascorbic acid	1.17g	
3)Methyl-4-hydroxybenzoate	0.75g	
4)Sorbic acid	0.379	
5)Aureomycin	1.87g	These compenents
6)Lin seed oil	1.87g	will be mixed
7)Vitamins solution	2.5ml	first.
8)Yeast tablets	12 g	
9)Water	127.5ml	
10)Agar agar	4.31g	These also mixed
11)Water	202.5ml	and add ta the first mixure.

RESULTS AND DISCUSSIONS

Until November 12th,some larvae and pupae were still in the incubator and it take much time to all the results in this trial. However some of the results of the results we got this experiment as sown in the next table can help to give one impression about this subject.

DATA FROM THE AVERAGE OF 10 REPLICATIONS

TABLE 6

TREATMENT	LARVAL DEATH (%)	STILL LARVA (%)	LARVAL PERIOD (DAYS)	PUPAE FORME (%)	PUPAL DEATH (%)	STILL PUPAE (%)	PUPAL PERIO (DAYS)	PUPAL WEIGH (mg)	ADULT EMERG (%)	SEX RAT M/F
A	20	OI	27	80	OI	10	>16@	267	70	3/4
B	100	OI	-	OI	OI	0	-		0	-
C	20	0	30	80	O I	O I	16	256	80	7/1
D	80	20	65	0	0	0	- i	-	-	?
E	30	0 i	33	70	30	10	>15@	257	30	1/2
I F I	50	20	>63@	3 0 1	O I	30	> 5@	160	0	?
G	10	O I	22	90	20	30	>17	265	40	2/2

The previous table sow clearly,the influence of the shell on the biology of Heliothis armigera.Hence the 3 treatments of whole seed show a high level of larval death and/or a long larval period.The highest level of larval death is recorded in ICP 1903 El wich is the most resistant to Heliothis armigera.Indeed, the testa of this varieties contein a high level of polyphenols and tanins wich are harmeful for the growth of insects.

Againstly what we was expecting,the dhal of the resistant varieties have the best percentage of adults and almost the in pupae formed comparatively to the susceptible and check.

We can notice tlnat also ,the weight of the late pupated larvae is lesser than tlhe earlieyer formated ones.

No dought,the genotypes contents have influenced the biology of Heliothis armigera,but it is difficult to withdraw a definitive conclusion about it.

We will be very glad to conduct this experiment in Senegal with cowpea or other legume available.

IMPRESSIONS AND PROPOSALS

During this training,we have noticed that insect pests recorded in pigeonpea(Cajanus cajan) are almost the same as recorded in cowpea (Vigna unguiculata) in Senegal.Therefore,most of the methodologies used here in ICRISAT can be impiemented in Senegal conditions for screening the genotypes for pest susceptibility.

It would have been intersting to continue some of the tria15 conducted like :Pigeonpea tria1 for insects resistance; and the antibiosis studies of Heliothis armigeria on pigeonpea. This last experiment can be used on Amsacta moloneyi wich cause much damage to cowpea in Senegal.

Also the techniques of screening(for about 3000 genotypes)used in pigeonpea can be tred on cowpea and that will be interesting in cowpea wich is a self polinated crop.

We should have spent more time with the pule entomologists from the begining of courses to have a better understanding of the field/laboratory experimentation.