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Organization of African Unity
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(OAU/STRC)

Semi Arid Food Grain Research and Development

(SAFGRAD)

WEST AND CENTRAL AFRICA COWPEA NETWORK

"Reseau Niébé de l'Afrique Centrale et Occidentale"

(RENACO)



3222

**RENACO 1992 Regional *Striga*
Resistance and Supplements of
other Trials**

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Declaration

Mention of a particular pesticide, any other chemical or products in this document does not imply endorsement of, or discrimination against any manufactured products by IITA/SAFGRAD.

Executive Summary

Because 1992 was a year during which no workshop was held, no new RENACO regional trials were distributed to National Agricultural Research Systems (NARS). Instead, they were encouraged to repeat the same regional trials conducted in 1991 to better appraise the materials introduced. Otherwise, to conduct adaptive research with promising materials in different recommendation domains for eventual release to farmers. However, new fresh seeds for the regional *Striga* resistance trial were dispatched to all countries that had conducted the trial in 1991. This was meant to ensure the purity of the entries being tested. In addition fresh seeds of regional trials were dispatched to NARS which requested for it on their own in 1992.

A total of 32 sets of the trial were distributed to NARS in May-June, 1992. They are summarized as below:

<u>Trial Name</u>	<u>No. of sets sent out</u>
1) Adaptation to Northern Guinea savanna	3
2) Adaptation to Sahelian-Sudanian zones	1
3) Adaptation to transition zones	4
4) <i>Striga</i> resistance	20
5) Bruchid insect pest resistance	4
6) Aphid insect pest resistance	1
Total	<hr/> 33

Feedback for 25 sets or 78% were received as of July 31, 1993.

The results of the *Striga* resistance showed the susceptible check, IT82E-32, to be the earliest and most densely *Striga* infested cultivar at most of the test locations. Of the three *Striga* resistant cultivars, only IT82D-849 and B301 exhibited the least *Striga* infestation at most locations; whereas TN5-78, was resistant to some locations and exhibited a certain level of susceptibility at some other locations. Three test cultivars: IT81D-994, KVx402-19-5 and KVx402-19-1, exhibited similar reactions as IT82D-849 and B301 at all locations. This indicated that they are likely to be *Striga* resistant too. Yield wise, IT81D-994 was among the least yielding cultivars; it, therefore, contrasted with the two other cultivars, KVx402-19-1 and KVx402-19-5, which were among the highest yielders. The latter two cultivars appeared, thus, not only useful in controlling *Striga* damages, but also ensured high productivity.

From the *Striga* resistance trial results, all cultivars purported to be *Striga* resistant were confirmed in Benin, Burkina Faso, Ghana and Mali at Cinzana. These locations can be classified as Group 1. Whereas the remaining locations where *Striga* resistance of most cultivars were not confirmed, were classified as Group 2. It is likely that *Striga* strains in Group

2 locations could have been more aggressive than those of Group 1 locations. It should be noted, however, that even in Group 1 locations, there was a low level of *Striga* infestation in most resistant cultivars. This may be due to the presence, at a low frequency, of virulent strains (genotypes) in a population of predominantly less virulent strains. Because none of the resistant cultivars was immune to *Striga* infestation at all locations, it could be assumed that continuous cultivation of a resistant cultivar, especially, if its *Striga* resistance was controlled by a single dominant gene, one could be imposing a selection pressure that might result to building up a virulent strain capable of causing even more serious damage to cowpea crop in the future. It is therefore, advisable to capitalize on more than one source of *Striga* resistance to control *Striga* damages in the sub-region.

The results of other regional trials are presented as a supplement of the 1991 results.

Introduction

Based on a decision taken by the RENACO Steering Committee during its March 1988 meeting, the Network, distributes new regional trials only during the year when a workshop is held. In the alternating year -for which a workshop is not held- national agricultural research systems (NARS) are encouraged to repeat regional trials received during the previous year and/or to conduct adaptive research with promising technologies identified. The rationale for this practice is to scale down the volume of introduction of new technologies by NARS to permit them to properly appraise promising technologies to ensure their quick and efficient transfer to farmers.

With regards to regional *Striga* resistance trial, because of possible spontaneous hybridation, natural mutation and varietal mixture could happen with any test cultivar, it was felt necessary that the network dispatches fresh seed to all participating member-countries for the experiment to be conducted for two years. This was intended to ensure purity of test cultivars and accurate results of their *Striga* resistance.

A total of 32 sets of regional trials were dispatched to member-countries on demand in May-June, 1992. The trials are summarized as below.

<u>Trial name</u>	<u>No. of sets sent out</u>
1) Adaptation to northern Guinea savanna	3
2) Adaptation to Sahelian-Sudanian zones	1
3) Adaptation to transition zones	4
4) <i>Striga</i> resistance	20
5) Bruchid insect pest resistance	4
6) Aphid insect pest resistance	1
Total	<hr/> 32

Feedback for 25 sets or 78% were received as presented in Table 1.0.

Table 1.0. RENACO Regional trails dispatched to member-countries in 1992/93

Country	Trial name											Total		
	Adaptation to						Resistance to							
	Guinea savanna		Sudanian-sahelian zones		Transition zones		Striga		Bruchids		Aphids		Sent	Feedb.
	Sent	Feedb.	Sent	Feedb.	Sent	Feedb.	Sent	Feedb.	Sent	Feedb.	Sent	Feedb.		
Benin	-	-	-	-	-	-	3	2	-	-	-	-	3	2
Burkina Faso	-	-	-	-	-	-	2	2	-	-	-	-	2	2
Cameroon	-	-	-	-	-	-	2	2	-	-	-	-	2	2
Cape Verde	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cent.Afr. Rep.	-	-	-	-	2	2	-	-	3	3	-	-	5	5
Chad	-	-	-	-	-	-	1	1	-	-	-	-	1	1
Côte d'Ivoire	-	-	-	-	1	1	-	-	-	-	-	-	1	1
Gambia	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ghana	-	-	-	-	-	-	1	1	-	-	-	-	1	1
Guinea Conakry	1	1	-	-	1	1	-	-	1	0	1	0	4	2
Guinea Bissau	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mali	-	-	-	-	-	-	2	2	-	-	-	-	2	2
Mauritania	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Niger	-	-	-	-	-	-	3	2	-	-	-	-	3	2
Nigeria	1	1	1	1	-	-	3	2	-	-	-	-	5	4
Senegal	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sierra Leone	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Togo	-	-	-	-	-	-	3	1	-	-	-	-	3	1
Total	2	2	1	1	4	4	20	15	4	3	1	0	32	25

I

Regional *Striga* Resistance Trial

1. Background

Striga gesnerioides is infesting cowpea in all agro-ecological zones found in West and Central Africa, particularly in sandy and or shallow soils, poor in organic matter where continuous cropping without fallow or any soil fertility restoration measures taken. *Striga* damages have a serious impact on cowpea production: farmers are often obliged to abandon some fields. This calls for effective and cheap control measures to reduce *Striga* infestation in major growing areas.

The 1992/93 regional *Striga* resistant trial consisted of repeating the trial that was conducted in 1991/92. This, in order to further appraise the *Striga* resistance of newly developed cultivars before they can be included in national adaptation trials for an eventual release. Seven of eight test cultivars originated from the Burkina national program. They are the outcome of crosses involving *Striga* resistant cultivars B301 and Suvita-2 (also known as Gorom local) or its descendants. The lines and other tested cultivars are described in Table 1.1.

A total of 20 sets were dispatched in June 1992 to Benin (3), Burkina Faso (2), Cameroon (2), Chad (1) Ghana (1), Mali (2), Niger (3), Nigeria (3) and Togo (3). A feedback of 16 sets, or 80%, was received from Benin (3), Burkina Faso (2), Cameroon (2), Chad (1), Ghana (1), Mali (2), Niger (2), Nigeria (2) and Togo (1). However, one trial conducted at Cana, Benin and the trial conducted in Chad are not reported as there was no evidence of *Striga* infestation in the field plots.

Table 1.1. Description of cultivars tested in the RENACO 1991/92 Regional *Striga* resistant trial.

Cultivar	Pedigree	Origin	Characteristics
1. Test cultivars			
1) KVx164-65-5	(IT82D-716 x KVx30-G467-5-10K)	Burkina Faso	Resistant to bruchids and <i>Striga</i> .
2) KVx291-47-222	(IT82D-716 x KVx30-G246-2-5K)	- do -	- do -
3) KVx397-6-6	(Suvita-2 x B301)	- do -	Adapted to Sahel and Sudan Savanas. Resistant to <i>Striga</i> .
4) KVx402-5-2	(KVx30-166-3G x B301)	- do -	- do -
5) KVx402-19-1	- do -	- do -	- do -
6) KVx402-19-5	- do -	- do -	- do -
7) KVx305-118-31	(KVx146-27-4 x KVx30-G246-2-5K)	- do -	Resistant to Aphids, Bruchids and <i>Striga</i> .
8) IT81D-994	(TVu1190 x TVu76) x (TVu2027 x TVu625)	IITA, Ibadan	Resistant to Bruchids and <i>Striga</i> .
2. Resistant checks			
9) TN5-78§	Landrace	Niger/Burkina	Resistant to <i>Striga</i> .
10) IT82D-849	(TVx1193-9F x Emmago) or (TVu1190 x Prima)	IITA, Ibadan	Resistant to <i>Striga</i> .
11) B301	Landrace	Botswana	Resistant to <i>Striga</i>
3. Susceptible check			
12) IT82E-32	{P33-1C x (TVu410 x SVS-32)} x TVu1190 x TVu2616)	IITA, Ibadan	Early maturing cultivar.

§ TN5-78 is a sister to Gorom local (Suvita-2) released in Burkina Faso.

2. Results

A) Benin

Cooperator: Sani O. Abou

The trial was conducted at three locations, Cana, Tindji and Zakpota in Southern Benin. The results from Cana are, however, not reported; in the test plot, there was no evidence of any *Striga* infestation.

a.1) Tindji

The trial was sown on August 9, 1992 in the coastal zone in a *Striga* sick plot that was not fertilized. Cowpea plants were protected against insect pests with insecticides (Deltamethrine and Malathion); they were harvested in November 1992. *Striga* shoots emerged earlier and were denser for the susceptible check, IT82E-32, than for any test cultivars (Table 1.2). The latter did not significantly differ from the resistant checks. This suggested that they were resistant to the Tindji *Striga gesnerioides* strain; confirming, thus, the 1991 results.

With regards to seed yield, the susceptible check, IT82E-32, which is also the best adapted cultivars for the ecological zone was the lowest yielder, although the difference in cultivar mean yield were not significant.

Table 1. 2. Performance of cowpea cultivars in *Striga* sick plot at Tindji, Benin, in 1992.

Cultivar	Days to <i>Striga</i> emergences § £	<i>Striga</i> density	Seed yield
1) <u>Test cultivars</u>	-- DAS --	--shoots/m ₂ --	--kg/ha--
KVx164-63-5	100a	0.00c	367a
KVx291-47-222	73b	0.21b	484a
KVx397-6-6	89ab	0.04bc	576a
KVx402-5-2	100a	0.00c	718a
KVx402-19-1	100a	0.00c	618a
KVx402-19-5	100a	0.00c	618a
KVx305-118-31	90ab	0.04bc	593a
IT81D-994	100a	0.00c	626a
2) <u>Resistant checks</u>			
TN5-78	89ab	0.04bc	827a
IT82D-849	100a	0.00c	509a
B301	90ab	0.04bc	576a
3) <u>Susceptible check</u>			
IT82E-32	32c	4.76a	321a
LSD (5%)	23	0.16	N.S.
C.V (%)	18	12	33

§ DAS = Days after sowing. £ = means followed by the same letter are not statistically different.

a.2) Zakpota

Zakpota (7°16'20", 2°14'10"E) is also located in coastal zone, not too far from Tindji. The trial was sown on September 11, 1992. Agronomic practices used were the same as for Tindji. However, the plot was invaded by livestock and no pods could be harvested. Nevertheless, *Striga* density data were gathered. They are given in Table 1.3. The susceptible check, IT82E-32, exhibited the highest *Striga* density than any other cultivar; it was followed by two resistant checks: IT82D-849 and B301. With perhaps the exception of KVx291-47-222 and IT81D-994, the test cultivars exhibited good resistance to the Zakpota *Striga* strain. These results agreed fully with those of 1991.

Table 1.3. Performance of cowpea cultivars in *Striga* sick plot at Zakpota, Benin in 1992.

Cultivar	<i>Striga</i> density
1) <u>Test cultivars</u>	--shoots/m ² --
KVx164-63-5	0.00d
KVx291-47-222	0.21d
KVx397-6-6	0.05d
KVx402-5-2	0.05d
KVx402-19-1	0.05d
KVx402-19-5	0.00d
KVx305-118-31	0.00d
IT81D-994	0.10d
2) <u>Resistant checks</u>	
TN5-78	0.05d
IT82D-849	1.10b
B301	0.69c
3) <u>Susceptible check</u>	
IT82E-32	3.30a
LSD 5%	0.25
C.V. (%)	15

b.1) Kamboinse

At Kamboinse (12°28'N, 01°33'W, 300m above sea level), near Ouagadougou, the trial was sown on 10 July, 1992. The *Striga* sick plot was fertilizer with NPK fertilizer at the rates of 14 kg N/ha, 23 kg P₂O₅/ha and 14 kg K₂O/ha; and cowpea plants were sprayed twice with insecticides (Deltamethrine and Dimethoate). The performance of cultivars is given in Table 1.4.

Striga shoots emerged the earliest for the susceptible check, IT82E-32, which did not differ significantly from KVx402-5-2, TN5-78 and KVx291-47-222. They emerged later for other cultivars.

Striga infestation was denser for the susceptible check than for any other cultivar; the latter, with the exception of KVx402-5-2, did not differ significantly from one another.

With regards to seed yield, cultivars KVx402-5-2, KVx402-19-1, KVx291-47-222 were among the highest yielders. Whereas the resistant checks and KVx397-6-6 were the lowest yielders; though they did not differ significantly with the intermediate yielders including the susceptible check, IT82E-32

b.2) Kouaré

The trial was sown on 16 July, 1992 at Kouaré, near Fada N'Gourma (12°04'N, 00°21'E, 292 m above sea level). The field plot was fertilized with an NPK fertilizer at the rates of 14 kg N/ha, 23 kg P₂O₅/ha and 14 kg K₂O/ha. Cowpea plants were sprayed twice with insecticides (Deltamethrine and Dimethoate). The performance of cultivars is given on Table 1.5. *Striga* shoots emerged earlier for the susceptible check, IT82E-32, which was also the most densely infested. The test cultivars did not differ significantly with the three resistant checks; although KVx291-47-222 and KVx402-5-2 tended to emerge *Striga* shoot earlier than other cultivars. Again the *Striga* results agreed with those of 1991.

With regards to seed yield, they were lower than 1991. The susceptible check, IT82E-32, yielded the highest, but did not differ significantly from cultivars KVx402-5-2 and KVx305-118-31. The occurrence of web blight disease might have been responsible for the observed low yield.

Table 1.4. Performance of cowpea cultivars in a *Striga* sick plot at Kamboinse, Burkina Faso in 1992.

Cultivar	Days to				Disease attacks			<i>Striga</i> density	Seed yield
	Flower buds formation	Flowering	Maturity	First <i>Striga</i> emergence	Virus	Brown blotch	Web blight		
1) <u>Test cultivars</u>	----- DAS -----				----- (1-5) -----			-shoot/m ² -	--kg/ha--
KVx164-63-5	32bcd	46bc	70b	100a	2.50cd	3.00ab	2.87bcd	0.00c	807bcd
KVx291-47-222	30cde	44cd	69bc	51def	2.25d	3.00ab	2.37cd	0.69c	978ab
KVx397-6-6	32bcd	45cd	67cd	86ab	3.62b	3.25a	3.50ab	0.16c	628cd
KVx402-5-2	29ef	43de	64e	42ef	3.25bc	2.25c	3.37ab	2.52b	1265a
KVx402-19-1	30de	44cd	67cd	74bcd	2.87bc	2.25c	3.50ab	0.32c	1025ab
KVx402-19-5	30de	44cd	67cd	76abc	2.87bc	2.50bc	3.62ab	0.27c	943abc
KVx305-118-31	34b	45bcd	69bc	59cde	2.50cd	3.25a	2.87bcd	0.32c	926bc
IT81D-994	47a	61a	81a	92ab	2.12d	1.25d	2.12d	0.00c	746bc
2) <u>Resistant checks</u>									
TN5-78	32bc	47b	70b	47ef	4.87a	3.00ab	2.87bcd	0.16c	565d
IT82D-849	30cde	43de	62e	100a	2.00d	2.25c	3.75a	0.00c	710bcd
B301	31cde	45bcd	64e	78abc	2.25d	2.00c	3.12abc	0.10c	784bcd
3) <u>Susceptible check</u>									
IT82E-32	28f	41e	60f	31f	2.25d	2.25c	2.50cd	24.28a	768bcd
LSD (5%)	2	2	2	25	1	0.59	0.83	0.96	335
C.V. (%)	5	4	2	25	23	16	19	23	27

Table 1. 5. Performance of cowpea cultivars in a *Striga* sick plot at Kouaré,
near Fada N'Gourma, Burkina Faso.

Cultivar	Days to			Web blight disease	<i>Striga</i> density	Seed yield
	Flowering	Maturity	First <i>Striga</i> emergence			
1) <u>Test cultivars</u>	-----DAS-----			--(1-5)--	--Shoots/m ² --	--kg/ha--
KVx164-63-5	48b	68bc	87ab	3.75ab	0.05b	580cde
KVx291-47-222	49b	70b	66b	3.37b	0.27b	533cde
KVx397-6-6	46b	67bc	89ab	3.87ab	0.10b	507cde
KVx402-5-2	47b	65bc	62bc	3.50b	0.27b	932ab
KVx402-19-1	45b	69b	79ab	3.87ab	0.27b	507cde
KVx402-19-5	46b	66bc	100a	3.87ab	0.00b	449def
KVx305-118-31	45b	69b	74ab	3.75ab	0.76b	775abc
IT81D-994	74a	86a	100a	2.50c	0.05b	170f
2) <u>Resistant checks</u>						
TN5-78	46b	67bc	83ab	3.87ab	0.10b	544cde
IT82D-849	46b	65bc	100a	3.62ab	0.00b	312ef
B301	47b	66bc	80ab	4.25a	0.50b	673bcd
<u>Susceptible check</u>						
IT82E-32	43b	62c	35c	3.25b	5.25a	996a
LSD (5%)	13	7	28	0.68	0.99	302
C.V. (%)	18	7	24	13	28	36

C) CameroonCooperator: C. Endondo

The trial was conducted at two locations: Douran and Maroua.

c.1) Douran

The trial was sown in a *Striga* sick plot on July 12, 1992. The plot was not fertilized. Cowpea plants were protected against insect pests with insecticides (Deltamethrine and Malathion). The performance of cultivars is given in Table 1.6. No significant difference in *Striga* density was observed amongst cultivars; although cultivars KVx291-47-222, KVx402-19-5 and KVx402-19-1 tended to be densely infested than others. Similarly, cultivars did not differ significantly for seed yield; the susceptible check: IT82E-32 tended, however, to yield the highest.

Table 1.6. Performance of cowpea cultivars in a *Striga* sick plot at Douran, Cameroon in 1992.

Cultivar	Days to maturity	<i>Striga</i> density	Seed yield
1) <u>Test cultivars</u>	--DAS--	-- shoots/m ² --	--kg/ha--
KVx164-63-5	83a	0.00a	896a
KVx291-47-22	77abc	3.20a	583a
KVx397-6-6	72cd	0.00a	304a
KVx402-5-2	66d	0.32a	1125a
KVx402-19-1	69cd	1.80a	687a
KVx402-19-5	70cd	2.61a	417a
KVx305-118-31	74bcd	0.56a	608a
IT81D-994	81ab	0.27a	320a
2) <u>Resistant checks</u>			
TN5-78	74bcd	0.76a	367a
IT82D-849	68d	0.00a	913a
B301	70cd	0.10a	838a
3) <u>Susceptible check</u>			
IT82E-32	68d	1.48a	1187a
LSD (5%)	9	NS.	NS.
C.V. (%)	8	45	63

c.2) Maroua

At Maroua, the trial was sown on July 9, 1992 in a *Striga* sick plot that was not fertilized. Cowpea plants were protected against insect pests with insecticides (Deltamethrine and Malathion). The reaction of cultivars to *Striga* infestation is given in Table 1.7. The susceptible check: IT82E-32, and KVx402-5-2 were the most densely *Striga* infested cultivars. Whereas two resistant checks: IT82D-849 and B301 and cultivars: IT81D-994, KVx164-63-5, KVx291-47-222 and KVx402-19-5 were amongst the least densely infested. The remaining cultivars and one resistant check TN5-78 were intermediate between the two groups.

Table 1.7. Performance of cowpea cultivars in a *Striga* sick plot at Maroua, Cameroon in 1992.

Cultivar	Viral disease attack	<i>Striga</i> density	Seed yield
1) <u>Test cultivars</u>	--(1-5)--	--shoots/m ² --	--Kg/ha--
KVx164-63-5	2.25cd	0.35de	987abc
KVx291-47-222	2.37cd	0.50cde	471de
KVx397-6-6	2.87ab	1.40cd	362de
KVx402-5-2	2.00de	5.25a	1013abc
KVx402-19-1	2.50bc	1.48bc	629cde
KVx402-19-5	2.62bc	1.25cd	516de
KVx305-118-31	2.37cd	2.52b	612cde
IT81D-994	2.87ab	0.05e	328de
2) <u>Resistant checks</u>			
TN5-78	3.12a	1.48bc	259e
IT82D-849	1.00g	0.00e	1188a
B301	1.50f	0.00e	683bcd
3) <u>Susceptible check</u>			
IT82E-32	1.75ef	5.25a	1096ab
LSD (5%)	0.38	1.11	423
C.V. (%)	11	24	43

With regards to yield, one resistant check, IT82D-849, the susceptible check IT82E-32 and two test cultivars: KVx402-5-2 and KVx164-63-5 were amongst the highest yielders. Whereas one resistant check, TN5-78, and the rest of test cultivars were the lowest yielders.

D) GhanaCooperator: K.O. Marfo

The trial was established at Manga (11°01'N, 00°16'W, 249m above sea level) in the Sudan savanna in *Striga* sick plot. The plot was fertilized with 48 kg P₂O₅/ha. Cowpea plants were protected against insect pests with insecticide (Karate). The performance of the cultivars is given in Table 1.8. Only the susceptible check was densely infested with *Striga* shoots as compared to other entries. The latter did not differ significantly from one another, which suggested that they were probably resistant to the Manga *Striga* strain. All entries yielded equally.

Table 1.8. Performance of cowpea cultivars in a *Striga* sick plot at Manga, Ghana in 1992.

Cultivar	Days to			<i>Striga</i> density	Seed yield
	Flower buds for- mation	Flowering	Maturity		
1) <u>Test cultivars</u> -----DAS----- -shoots/m ² -kg/ha-					
KVx164-63-5	38b	45b	67b	0.96b	541a
KVx291-47-22	38b	44b	67b	0.05d	500a
KVx397-6-6	36b	44b	62c	0.16cd	708a
KVx402-5-2	38b	44b	67b	0.00d	458a
KVx402-19-1	38b	45b	62c	0.44bcd	542a
KVx402-19-5	37b	45b	62c	0.00d	667a
KVx305-118-31	38b	46b	62c	0.32bcd	583a
IT81D-994	64a	68a	80a	0.05d	417a
2) <u>Resistant checks</u>					
TN5-78	38b	46b	67b	0.16cd	625a
IT82D-849	37b	41b	55d	0.76bc	416a
B301	38b	46b	62c	0.00d	709a
3) <u>Susceptible check</u>					
IT82E-38	35b	41b	55d	3.00a	556a
LSD (5%)	10	9	0.4	0.70	NS
C.V. (%)	10	13	6	25	35

E) MaliCooperator: Aliou Traore

The trial was conducted at two locations in Mali.

e.1) Cinzana

The trial was established at Cinzana, in the sudan savanna, on July 3, 1992 in a *Striga* sick plot. *Striga* shoots emerged earlier for the susceptible check, IT82E-32, one resistant check, TN5-78, and four test cultivars: KVx402-5-2, KVx305-118-31, KVx397-6-6 and KVx291-47-222 than for the remaining entries (Table 1.9). The susceptible check, IT82E-32, was more densely infested than any other cultivar. Whereas the remaining entries, with perhaps the exception of KVx402-5-2, were either the least infested or free from *Striga* infestation. One resistant check, TN5-78, and four test cultivars: KVx305-118-31, KVx402-5-2, KVx397-6-6 and KVx402-19-1 yielded the highest; whereas the susceptible check, IT82E-32, two resistant checks: IT82D-849 and B301, and two test cultivars: KVx402-19-5 and IT81D-994 yielded the least.

Table 1.9. Performance of cowpea cultivars in a *Striga* sick plot at Cinzana, Mali in 1992.

Cultivar	Days to			<i>Striga</i> density	Seed yield
	Flower buds for- mation	Flowering	First <i>Striga</i> emergence		
1) <u>Test cultivars</u> -----DAS----- --shoots/m ² -- --kg/ha--					
KVx164-63-5	50b	58b	91ab	0.05b	331bcde
KVx291-47-222	48b	53b	73bcd	0.76b	444bcd
KVx397-6-6	46b	50b	71cd	0.56b	475abc
KVx402-5-2	45b	50b	69d	2.80b	514abc
KVx402-19-1	47b	51b	90abc	0.16b	458abcd
KVx402-19-5	46b	51b	100a	0.00b	236cdef
KVx305-118-31	48b	54b	73bcd	0.21b	536ab
IT81D-994	77a	80a	100a	0.00b	174def
2) <u>Resistant checks</u>					
TN-78	47b	52b	64d	1.64b	740a
IT82D-849	45b	50b	98a	1.10b	263bcdef
B301	46b	52b	100a	0.00b	145ef
3) <u>Susceptible check</u>					
IT82E-32	47b	54b	60d	11.96a	25f
LSD (5%)	12	11	19	3.33	294
C.V. (%)	17	14	16	45	56

e.2) Koporo

The trial was established at Koporo, in the Sahel, in mid-July 1992 in a *Striga* sick plot. The susceptible check, IT82E-32, and one test cultivar, KVx402-5-2, were heavily infested with *Striga* (Table 1.10); they were followed by test cultivars: KVx305-118-31, KVx291-47-22 and, to some extent, KVx397-6-6 and KVx402-19-1. The remaining entries were either least infested or free from *Striga* infestation. The highest yield was given by one resistant check, TN5-78, and two test cultivars, KVx402-19-5 and KVx402-19-1. Whereas the least yield was given by KVx402-5-2 and the susceptible check, IT82E-32, both of which were heavily *Striga* infested. The results suggested that at this location, *Striga* infestation caused severe damage to cowpea crops: a negative correlation ($r = -0.33^*$) was observed between *Striga* density and cowpea seed yield.

Table 1.10. Performance of cowpea cultivars in a *Striga* sick plot at Koporo, Mali in 1992.

Cultivar	Days to		<i>Striga</i> density	Seed yield
	Flowering	Maturity		
1) Test cultivars	-----DAS-----		--Shoots/m ² --	--Kg/ha--
KVx164-63-5	53b	74a	7.95f	1023cd
KVx291-47-222	47cd	72a	38.04cd	918d
KVx397-6-6	46cd	70a	24.34df	1294bcd
KVx402-5-2	47cd	70a	85.88b	637de
KVx402-19-1	47cd	70a	15.03ef	1712abc
KVx402-19-5	47cd	70a	2.15f	1983abc
KVx305-118-31	50bc	71a	51.40c	981cd
IT81D-994	61a	85a	0.99f	898d
2) Resistant checks				
TN5-78	49bcd	72a	7.38f	2192a
IT82D-849	45d	67a	0.00f	877d
B301	53b	74a	7.07f	1293bcd
3) Susceptible check				
IT82E-32	49bcd	67a	106.54a	42e
LSD (5%)	4	-	16.15	774
C.V. (%)	6	-	30	47

F) Niger

Cooperator: Hassane Hamma

The trial was established at two locations in Sahelo-Sudanian zones of Niger:

f.1) Konni

At Konni (13°48'N, 05°15'W, 272m above sea level), the trial was sown on 15 July, 1992 in a *Striga* sick plot. The plot was fertilized with 13.5 kg P₂O₅/ha as single super phosphate. The performance of entries is given in Table 1.11.

Table 1.11. Performance of cowpea cultivars in a *Striga* sick plot at Konni, Niger in 1992.

Cultivar	Days to			<i>Striga</i> density	Seed yield
	Flowering	Maturity	First <i>Striga</i> emergence		
1) <u>Test cultivars</u>	-----DAS-----			--Shoots/m ² --	--Kg/ha--
KVx164-63-5	51b	75b	41c	2.15de	918de
KVx291-47-222	50b	74b	37c	4.40bc	835e
KVx397-6-6	48b	61c	37c	1.40def	1545bc
KVx402-5-2	48b	61c	35c	2.90cd	1336bcd
KVx402-19-1	49b	62c	41c	0.38ef	1482bc
KVx402-19-5	49b	62c	85ab	0.16f	2088a
KVx305-118-31	50b	66bc	34c	5.50ab	1148cde
IT81D-994	79a	90a	44c	0.63ef	21f
2) <u>Resistant checks</u>					
TN5-78	49b	66bc	34c	1.25def	1691ab
IT82D-849	48b	59c	100a	0.00f	939de
B301	52b	62c	72b	0.10f	1482bc
3) <u>Susceptible check</u>					
IT82E-32	45b	59c	35c	7.27a	918de
LSD (5%)	10	11	26	1.91	488
C.V. (%)	13	12	36	29	28

With the exception of two resistant checks, IT82D-849 and B301, and one test cultivar, KVx402-19-5, *Striga* shoots emerged earlier for all the remaining entries; the latter did not differ significantly with the susceptible check, IT82E-32, for the number of days to first *Striga* emergence. The susceptible check, IT82E-32, and four test cultivars: KVx305-118-31, KVx291-47-222, KVx402-5-2 and KVx164-63-5 were amongst the densely infested entries. Whereas the remaining entries were not significantly different from the resistant checks. They appeared, thus, to be resistant to the Konni's *Striga* strain. Yield wise, one test cultivar, KVx402-19-5, and one resistant check, TN5-78, yielded the highest. Whereas the susceptible check, IT82E-32, one resistant check IT82D-849, and four test cultivars: KVx305-118-31, KVx164-63-5, KVx291-47-222 and IT81D-994 yielded the least.

f.2) Tarna

At Tarna (13°28'N, 07°07'W, 350m above sea level), near Maradi, the trial was established in a *Striga* sick plot in mid-July. The susceptible check, IT82E-32, a resistant check, TN5-78 and test cultivars: KVx305-118-31, KVx402-5-2, KVx291-47-222 and KVx164-63-5 were the most densely infested entries (Table 1.12). Whereas two resistant checks: IT82D-849 and B301 and three test cultivars: KVx397-6-6, KVx402-19-1 and KVx402-19-5 were the least *Striga* infested cultivars; they did not differ from one another, implying that they are probably *Striga* resistant. Seed yield data were not reported at this locations.

Table 1.12. Performance of cowpea cultivars in a *Striga* sick plot at Tarna, near Maradi, Niger.

Cultivar	<i>Striga</i> density
1) <u>Test cultivars:</u>	--Shoots/m ² --
KVx164-63-5	7.41c
KVx291-47-222	9.56c
KVx397-6-6	2.24d
KVx402-5-2	9.73bc
KVx402-19-1	1.18de
KVx402-19-5	1.50de
KVx305-118-31	9.73bc
IT81D-994	3.10d
2) <u>Resistant checks</u>	
TN5-78	12.51ab
IT82D-849	0.00e
B301	0.05e
3) <u>Susceptible check</u>	
IT82E-32	13.25a
LSD (5%)	2.83
C.V (%)	24

G) Nigeria

Cooperator: O.O. Olufajo & A.A. Zaria

The trial was established at two locations: Bakura and Minjibir in the Sudan savanna.

g.1) Bakura

At Bakura (12°48'N, 05°53'E), the trial was sown on August 1, 1992 in a *Striga* sick plot. The plot was fertilized with 36 kg P₂O₅/ha as single super phosphate. Cowpea plants were protected against insect pests with insecticides (Deltamethrine and Dimethoate). The performance of entries is given in Table 1.13. The susceptible check, IT82E-32, and two test cultivars: KVx402-5-2 and KVx305-118-31 were significantly infested with *Striga* as compared to other entries. Since the remaining test cultivars had low infestation and did not differ from the resistant checks, this could mean that they are resistant to the *Striga* strain at Bakura. Yieldwise, only one resistant check B301 outyielded any other entry. It was followed by the susceptible check, IT82E-32, and two test cultivars: KVx402-19-1 and KVx402-5-2. All the remaining entries yielded the least.

Table 1.13. Performance of cowpea cultivars in a *Striga* sick plot at Bakura, Nigeria in 1992.

Cultivar	Days to		<i>Striga</i> density	Seed yield
	Flowering	Maturity		
1) <u>Test cultivars</u>	-----DAS-----		--Shoots/m ² --	--Kg/ha--
KVx164-63-5	49b	60b	0.21de	459cde
KVx291-47-222	48b	58b	0.21de	314de
KVx397-6-6	46b	55b	0.05ef	366de
KVx402-5-2	45b	54b	1.03a	737bcd
KVx402-19-1	46b	57b	0.27d	876bc
KVx402-19-5	47b	57b	0.05ef	432cde
KVx305-118-31	48b	57b	0.56c	348de
IT81D-994	87a	89a	0.10def	56e
2) <u>Resistant checks</u>				
TN5-78	48b	56b	0.05ef	484cde
IT82D-849	46b	54b	0.00f	424cde
B301	46b	54b	0.05f	1879a
3) <u>Susceptible check</u>				
IT82E-32	43b	51b	0.76p	1023b
LSD (5%)	11	9	0.18	499
C.V. (%)	15	11	13	56

g.2) Minjibir

At Minjibir (12°10'N, 8°40'E), the trial was sown on July 29, 1993 in a *Striga* sick plot. The plot was fertilized with 36 kg P₂O₅/ha as single super phosphate. Cowpea plants were protected against insect pests with an insecticide (Sherpa plus E.C). The performance of entries is given in Table 1.14.

The susceptible check, IT82E-32, one resistant check, TN5-78, and two test cultivars, KVx402-5-2 and KVx305-118-31 were the most *Striga* infested entries. Whereas two resistant checks, IT82D-849 and B301, and five test cultivars: KVx397-6-6, KVx291-47-222, KVx402-19-1, IT81D-994 and KVx402-19-5 had the least *Striga* infestation, suggesting that these test cultivars might be *Striga* resistant. The high yielding cultivars included only the susceptible check, IT82E-32, two resistant checks, B301 and IT82D-849 and one test cultivar, KVx402-19-1.

H) Togo

Cooperator: P. Toky

The trial was established at Pissare in the Sudan savanna, in northern Togo. It was sown on July 10, 1992 in a *Striga* sick plot that was fertilized with N, P₂O₅ and K₂O at a rate of 22.5 kg/ha each. Cowpea plants were protected against insect pests with insecticides (Cypermethrine and Dimethoate). The performance of entries is given in Table 1.15. The susceptible check, IT82E-32, one resistant check, TN5-78, and two test cultivars: KVx402-5-2 and KVx305-118-31 were the most *Striga* infested entries. Since the remaining test cultivars, with perhaps the exception of KVx291-47-222, were among the least *Striga* infested and did not differ significantly from two *Striga* resistant checks, B301 and IT82D-849, this implied that these cultivars might be resistant to the Pissare *Striga* strain. The susceptible check, IT82E-32, one resistant check, IT82D-849 and one test cultivar were the only entries that exhibited the lowest grain yield.

Table 1.14. Performance of cowpea cultivars in a *Striga* sick plot at Minjibir, Nigeria in 1992.

Cultivar	Days to		Viral diseases attack	<i>Striga</i> density	Seed yield
	Maturity	First <i>Striga</i> emergence			
1) <u>Test cultivars</u>	-----DAS-----		-(1-5)-	--Shoots/m ² --	--kg/ha--
KVx164-63-5	73b	57bc	2.00bc	1.33d	311bcd
KVx291-47-222	72b	55bc	2.00bc	0.82de	246cd
KVx397-6-6	69b	64bc	1.50cde	0.96de	286bcd
KVx402-5-2	70b	50c	1.75bcd	3.10a	100d
KVx402-19-1	70b	55bc	2.00bc	0.69def	403abc
KVx402-19-5	71b	91a	2.00bc	0.05fg	336bc
KVx305-118-31	72b	52c	2.25b	2.71ab	269bcd
IT81D-994	79a	69b	1.25de	0.56efg	229cd
2) <u>Resistant checks</u>					
TN5-78	71b	52bc	3.00a	1.98c	77d
IT82D-849	69b	100a	1.25de	0.00g	440abc
B301	70b	100a	1.50cde	0.00g	501ab
3) <u>Susceptible check</u>					
IT82E-32	62c	52c	1.00e	2.42bc	578a
LSD (5%)	6	16	0.74	0.64	234
C.V (%)	5	17	29	19	52

Table 1.15. Performance of cowpea cultivars in a *Striga* sick plot at Pissare, Togo in 1992.

Cultivar	Days to		<i>Striga</i> density	Seed yield
	Flowering	Maturity		
1) <u>Test cultivars</u>	-----DAS-----		--Shoots/m ² --	--Kg/ha--
KVx164-63-5	49cd	68b	0.56c	1111a
KVx291-47-222	49cd	68b	3.73abc	872ab
KVx397-6-6	49cd	68b	0.96bc	783ab
KVx402-5-2	52a	68b	13.02a	879ab
KVx402-19-1	49cd	68b	2.24bc	762ab
KVx402-19-5	50abc	68b	0.44c	829ab
KVx305-118-31	50abc	68b	4.64abc	1044a
IT81D-994	51ab	71a	0.27c	185c
2) <u>Resistant checks</u>				
TN5-78	50abc	68b	6.70abc	822ab
IT82D-849	49cd	58c	0.00c	622b
B301	50abc	68b	0.38c	1115a
3) <u>Susceptible check</u>				
IT82E-32	49cd	60c	10.39ab	495bc
LSD (5%)	2	1	9.74	386
C.V (%)	3	2	56	34

Conclusion

Striga infestation

Striga density was significantly affected by location, cultivar and their interaction. Tarna, Niger, and Kopro, Mali, were the most *Striga* infested locations (Table 1.16). They were followed by Pissare, Togo, and Konni, Niger. The remaining locations did not differ significantly from one another.

None of the cultivars was immune to *Striga* infestation at all the locations. The *Striga* susceptibility of IT82E-32 is well illustrated by its high average *Striga* density across locations (Table 1.16). Two resistant checks, B301 and IT82D-849, had the least *Striga* infestation density, which had above average stability ($\beta < 1$) (Table 1.16); their regression line of mean *Striga* density on mean *Striga* density after different *Striga* sick locations accounted only for 13% of total *Striga* infestation variation. This confirmed their *Striga* resistance at all test locations. Three test cultivars: IT81D-994, KVx402-19-5 and

KVx402-19-1, exhibited similar reactions as IT82D-849 and B301 at all locations. This implied that, they are likely to be also *Striga* resistant (Table 1.16).

The remaining test cultivars had a moderate level of resistance to *Striga* infestation as did the resistant check TN5-78. Most of them responded positively to heavily infested locations (or locations with more virulent *Striga* strains) in Cameroon, Mali (only at Koporo), Niger, Nigeria and Togo.

From the results, the *Striga* resistance of all purported *Striga* resistant cultivars in Benin, Burkina Faso, Ghana and Mali (Cinzana) were referred to as Group 1. At the remaining locations, referred to as Group 2, the *Striga* resistance of most cultivars were not confirmed. *Striga* strains in Group 2 locations could have been more virulent than those in Group 1 locations. It should be noted, however, that even in Group 1 locations, there was a low level of *Striga* infestation in most resistant cultivars. This could be due to the presence, at a low frequency, of virulent strains in a population of predominantly less virulent strains. It appears, therefore, by continuously growing a resistant cultivar, particularly if the resistance is controlled by a single dominant gene, one might be putting a selection pressure that could result in building up virulent strains that may cause more damage to cowpea crop in the future. It is, therefore, imperative to capitalize on more than one source of *Striga* resistance to effectively control *Striga* infestation in the sub-region.

Seed yield

Seed yield of cultivars was affected significantly by location, cultivar and their interaction. Yield data were, however, not collected at Zakpota, Benin, and Tarna, Niger. Konni, Niger, and Koporo, Mali, were the highest yielding locations (Table 1.17). Whereas Minjibir, Nigeria and Cinzana, Mali, were the least yielding locations. Since these locations were not particularly heavily infested with *Striga* (Table 1.16), this suggested that other factors in addition to *Striga* infestation also contributed to yield losses.

With the exception of IT82D-849 (a *Striga* resistant check) and KVx402-5-2 (a *Striga* susceptible cultivar) (Table 1.16), the highest yield was obtained from *Striga* resistant cultivars: B301, KVx402-19-1, KVx402-19-5 and TN5-78 (Tables 1.16 & 1.17). This implied that they were the most adapted cultivars under the trial conditions. However, unlike B301, the yield of KVx402-19-1 and KVx402-19-5 significantly increased with improvement of environmental conditions ($\beta > 1$), Table 1.17; their regression line accounted for more than 80% of yield variation. These two cultivars can, therefore, be used confidently across locations to control *Striga* infestation.

The low yield of *Striga* resistant cultivars IT82D-849 and IT81D-994 could be ascribed to, respectively, high susceptibility to bacterial blight disease and the inherently poor seed germination. Whereas the high yield of the *Striga* susceptible test cultivar KVx402-5-2 would be an expression of its *Striga* tolerance.

Both the 1992 *Striga* infestation and yield results confirmed those of the 1991 regional trials.

Table 1.16. *Striga* infestation density (shoots/m²) as affected by location and cultivar; and slope (β) and coefficient of determination (r^2) associated with the regression line of mean *Striga* densities of cultivars on mean *Striga* density after different *Striga* sick locations in West and Central Africa in 1992.

Location effect		Cultivar effect			
Location	<i>Striga</i> density	Cultivar	<i>Striga</i> density§	β	r^2
- Benin		1. <u>Test cultivars</u>			
. Tindji	0.28d	. KVx164-63-5	0.79bc	0.94	0.56
. Zakpota	0.38d	. KVx291-47-222	1.74bc	1.59*	0.83
- Burkina Faso		. KVx397-6-6	0.74c	0.79	0.78
. Kamboinse	1.20cd	. KVx402-5-2	2.98b	2.26**	0.85
. Kouare (Fada)	0.48d	. KVx402-19-1	0.69c	0.38**	0.36
- Cameroon		. KVx402-19-5	0.38c	0.17**	0.07
. Douran	0.80cd	. KVx305-118-31	2.02bc	1.80**	0.88
. Maroua	1.37cd	. IT81D-994	0.32c	0.44**	0.45
- Ghana		2. <u>Resistant checks</u>			
. Manga	0.42d	. TN5-78 (Suvita-2)	1.76bc	1.92**	0.90
- Mali		. IT82D-849	0.12c	-0.12**	0.13
. Cinzana	1.01cd	. B301	0.22c	0.14**	0.13
. Koproro	4.12a				
- Niger		3. <u>Susceptible check</u>			
. Konni	1.81bc	. IT82E-32	6.82a	1.69	0.41
. Tarna	4.72a				
- Nigeria		LSD (5%)	0.19	-	-
. Bakura	0.26d	C.V. (%)	34	-	-
. Minjibir	1.10cd				
- Togo					
. Bissare	2.79b				
LSD (5%)	1.30				
C.V. (%)	34				

§ = Means followed by the same letters are not statistically significant at 5% probability level.

*, ** = Significant at respectively, 5 and 1% probability level.

Table 1.17. Seed yield as affected by location and cultivar; and slope (β) and coefficient of determination (r^2) associated with regression line of mean yields of cultivars on mean yield at different *Striga* sick locations in West and Central Africa in 1992.

Location effect		Cultivar effect			
Location	Seed yield	Cultivar	Seed yield	β	r^2
- Benin	--kg/ha--	1. Test cultivars	--kg/ha--		
. Tindji	569de	KVx164-63-5	690bcd	0.85	0.60
. Zakpota	-	KVx291-47-222	598d	0.74	0.68
- Burkina Faso		KVx397-6-6	653cd	1.24	0.72
. Kamboinse	845b	KVx402-5-2	809ab	0.84	0.41
. Kouare (Fada)	582cd	KVx402-19-1	808ab	1.42*	0.88
- Cameroon		KVx402-19-5	793ab	2.10**	0.86
. Douran	687bcd	KVx305-118-31	702bcd	0.86	0.71
. Maroua	679bcd	IT81D-994	347e	0.29*	0.08
- Ghana		2. Resistant checks			
. Manga	548de	TN5-78 (Suvita-2)	764abc	1.76+	0.64
- Mali		IT82D-849	635d	0.70	0.42
. Cinzana	362ef	B301	885ab	1.11	0.40
. Kopro	1151a	3. Susceptible check			
- Niger		IT82E-32	662cd	0.10+	0.01
. Konni	1200a				
. Tarna	-				
- Nigeria		LSD (5%)	122	-	-
. Bakura	616cd	C.V (%)	44	-	-
. Minjibir	315f				
- Togo					
. Pissare	793bc				
	LSD (5%)				
	213				
	C.V (%)				
	44				

II

Supplementary Results

2.1. Introduction

Additional results for the 1991-92 regional trials are reported here for the adaptation trials. They are either the 1991 data that were not received early and therefore were not reported in 1992 or data from of the 1991 trials repeated by national programs in 1992 as desired. They include:

- . Adaptation to northern Guinea savanna;
- . Adaptation to Sudan savanna;
- . Adaptation to Transition zones; and
- . Bruchid insect pest resistance.

2.2. Adaptation to Northern Guinea savanna

Two sets were dispatched in June 1992 to two countries: Guinea Conakry and Nigeria. Feedback was received from both countries; also received in 1993 was feedback for one set of the same trial dispatched to Guinea Bissau in 1991. They are reported below. The trial included 9 test cultivars and 3 checks; they are described in Table 2.2.1.

Table 2.2.1. Description of cultivars tested in a regional trial for adaptation to northern Guinea savanna in 1991-92.

Cultivar	Pedigree	Origin	Characteristics
1. Test cultivars			
1. CR-06-07	(IT82E-32 x Amantin)	Ghana	-
2. KVx305-2-118-23-31	(KVx146-27-4 x KVx30-G246-2-5K)	Burkina Faso	Resistant to Aphids, Bruchids and <i>Striga</i>
3. KVx305-118-31	- do -	- do -	- do -
4. KVx402-5-2	(KVx30-166-3G x B301)	- do -	Resistant to <i>Striga</i>
5. KVx402-19-1	- do -	- do -	- do -
6. IAR7/180-4-5-1	-	Nigeria	Adapted to Guinea savanna
7. IAR7/180-4-5-1	-	Nigeria	- do -
8. KVx398-7-1	(KVx61-74 x B301)	Burkina Faso	Resistant to <i>Striga</i>
9. KVx396-4-5-2D	(Vita-7 x Suvita-2) x IAR-1696	IITA/Ibadan	Adapted to Sahel, & Sudan, Guinea savannas
2. Check cultivars			
10. KN-1 (Vita-7)	(TVu37 x TVu530) x TVu115 x TVu1038)	IITA/Ibadan	Adapted to Guinea savanna
11. TVx 3236	(TVu1509 x Ife brown)	- do -	Adapted to Sahel, Sudan, & Guinea savannas
12. Local check	-	-	-

a) Guinea Bissau

Cooperator: Domingos Fonseca

The trial was sown on July 30, 1991 at Contuboel (12°12'40'N, 14°33'25W 8.5m above sea level). The plot was fertilized with 45 kg

P₂O₅/ha as triple super phosphate. Cowpea plants were not protected against insect pests and were harvested in October, 1991. The performance of the cultivars is given in Table 2.2.2. Two test cultivars: KVx402-5-2 and KVx396-4-5-2D and the local check, Pliplolon, were early flowering, maturing and highest yielders of the entries.

Table 2.2.2. Performance of cowpea cultivars at Contuboel, Guinea Bissau, in the northern Guinea savanna in 1991.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
1. Test cultivars -----DAS----- --Kg/ha--				
1. CR-06-07	38ab	50a	74a	829b
2. KVx305-2-118-23-2	39ab	77a	84a	30e
3. KVx305-118-31	39ab	53a	72a	92de
4. KVx402-5-2	35c	49a	68a	1106ab
5. KVx402-19-1	38b	52a	70a	836b
6. IAR7/180-4-5	35c	72a	87a	80e
7. IAR7/180-4-5-1	35c	71a	82a	137de
8. KVx398-7-1	40a	75a	85a	17e
9. KVx396-4-5-2D	39ab	47a	70a	1245a
2. Checks				
10. KN-1 (Vita-7)	38b	52a	70a	489c
11. TVx3236	40a	52a	71a	406cd
12. Pliplolon	35c	46a	68a	1036ab
LSD (5%)	2	NS	NS	321
C.V. (%)	2	30	14	28

b) Guinea Conakry

Cooperator: F.L. Guilavogui, M. Kaba & M.L. Diallo

The trial was sown on June 10, 1992 at Kankan (10°23'N, 9°15'W 376m above sea level) on a plot that was fertilized with N.P.K fertilizer at the rate of 19 kg N/ha, 12 kg P₂O₅/ha and 6 kg K₂O/ha. Cowpea plants were protected against insect pests with insecticides (Diazinon) and harvested in mid-August 1993. The performance of cultivars is given in Table 2.2.3. Cultivars KVx396-2-5-2D, IAR7/180-4-5 and KVx402-5-2, gave the highest yields. Whereas the local check, Sinkoka, KVx305-118-31 and IAR7/180-4-5-1 were amongst the low yielding cultivars.

Table 2.2.3. Performance of cowpea cultivars at Kankan, Guinea Conakry, in the northern Guinea savanna in 1992.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	-----DAS-----			--Kg/ha--
1. Test cultivars				
1. CR-06-07	29bc	42e	69cd	1124bc
2. KVx305-2-118-23-2	30ab	45abcd	79ab	839c
3. KVx305-118-31	31a	47a	77abc	1180bc
4. KVx402-5-2	30ab	42e	67d	1344abc
5. KVx402-19-1	31a	44bcde	71bcd	1284bc
6. IAR7/180-4-5	30ab	46ab	78abc	1588ab
7. IAR7/180-4-5-1	30ab	46ab	72abcd	828c
8. KVx398-7-1	30ab	45abcd	75abcd	1011bc
9. KVx396-4-5-2D	31a	46ab	80a	1930a
2. Checks				
10. KN-1 (Vita-7)	30ab	43cde	72abcd	1076bc
11. TVx3236	31a	45abcd	76abc	1233bc
12. Local Sinkoka	28c	43de	66d	1066bc
LSD (5%)	1.7	2	9	603
C.V. (%)	4	4	8	35

c) Nigeria

Cooperator: O.O. Olufajo & A.A. Zaria

The trial was sown on July 29, 1993 at Zaria (11°11'N, 07°38'E 686m above sea level) on an *Alectra* sick plot that was fertilized with 36 kg P₂O₅/ha as single super phosphate. Cowpea plants were protected against insect pests, fungal diseases and weeds, using the following pesticides respectively, Cymbush 10E, Benlate and Roger E.C. The crop was harvested in mid-November, 1992. The performance of cultivars is given in Table 2.2.4. The following cultivars gave the lowest yield: KVx305-2-118-23-2, TVx3236, KVx305-118-31, KVx402-5-2, and KVx402-19-1. They appear not to be adapted to *Alectra* infestation conditions.

Table 2.2.4. Performance of cowpea cultivars at Zaria, Nigeria, in the northern Guinea savanna in 1992

Cultivar	Days to		Alectra density	Seed yield
	Flowering	Maturity		
1. Test cultivars	-----DAS-----		--shoots/m ² --	--kg/ha--
1. CR-06-07	61a	90a	0.21ef	1313abcd
2. KVx305-2-118-23-2	57a	88a	2.13a	1292bcd
3. KVx305-118-31	54a	90a	1.56b	986cde
4. KVx402-5-2	58a	91a	0.21ef	937de
5. KVx402-19-1	55a	88a	1.31bc	685e
6. IAR7/180-4-5	63a	91a	0.56d	1431abc
7. IAR/7180-4-5-1	61a	95a	1.40b	1494abc
8. KVx398-7-1	55a	87a	0.04f	1398bacd
9. KVx396-4-5-2D	60a	90a	0.37de	1513ab
2. Checks				
10. KN-1 (Vita-7)	57a	88a	0.04f	1773a
11. TVx3236	57a	88a	1.10c	1083bcde
12. Local (IAR 48)	63a	92a	1.31bc	1479ab
LSD (5%)	NS	NS	0.29	463
C.V. (%)	8	4	14	25

2.3. Adaptation to Sudan savanna

Only one set of the trial was dispatched, on demand, to Nigeria in May 1992. Cultivar description is presented in Table 2.3.1. Feedback was as below:

Table 2.3.1. Description of cultivars used in a regional trial for adaptation to Sudanian-Sahelian zones in 1991-92.

Cultivar	Pedigree	Origin	Characteristics
1. Test cultivars			
1. KVx396-4-5-2D	(IAR1696 x Vita-7) x (Suvita-2)	Burkina Faso	Adapted to the Sahel, Sudan & northern Guinea savannas
2. KVx164-41-64	(IT82D-716 x KVx30-G467-5-10K)	- do -	Resistant to bruchids & <i>Striga</i>
3. KVx402-5-2	(KVx30-166-3G x B301)	- do -	Adapted to the Sahel & Sudan savanna & resistant to <i>Striga</i>
4. KVx402-19-5	- do -	- do -	- do -
5. IS86-275N	(58-57 x IT81D-1137)	ISRA/ Senegal	Adapted to the Sahel & Sudan savannas
6. B89-504N	-	- do -	- do -
7. KVx396-18-10	(IAR1696 x Vita-7) x Suvita-2	Burkina Faso	- do -
8. ITN89E-3	-	IITA/ ICRISAT Niger	- do -
9. KVx396-16-10/1	(IAR1696 x Vita-7) x Suvita-2	Burkina Faso	- do -
10. KB85-18	-	INRAN Niger	Adapted to the Sahel Sudan savannas.
2. Check cultivars			
11. KVx3236	(TVx1509 x Ife brown)	IITA	Adapted to the Sahel, Sudan and Guinea savannas.
12. Local check	-	-	-

a) Nigeria

Cooperator: O.O. Olufajo and A.A. Zaria.

The trial was sown on July 29, 1992 at Minjibir in a *Striga* sick plot that was fertilized with 36 kg P₂O₅/ha as single super phosphate. Cowpea plants were protected against insect pest with an insecticide, Sherpa plus. The crop was harvested in late October 1992. The performance of cultivars is given in Table 2.3.2. All cultivars were infested with *Striga*; however, those for which *Striga* emerged early were also the most densely infested; they included: KVx396-4-5-2D, KVx402-5-2, B89-504N, KVx396-18-10, ITN89E-3, KB85-18 and the local check, Sampea 7. The highest yield was achieved by only 2 test cultivars: B89-504N, KVx396-4-5-2D.

Table 2.3.2. Performance of cowpea cultivars at Minjibir, Nigeria in the Sudan Savanna in 1992.

Cultivars	Days to				First Striga emergence	Striga density	Seed yield
	Flower	Flowering	Maturity				
	-----DAS-----					--shoots/m ² --	--kg/ha--
1. Test cultivar							
1. KVx396-4-5-2D	38ab	50ab	73ab	47cd	0.25bcd	1301a	
2. KVx164-41-64	35d	51ab	71bcd	90a	0.04d	200e	
3. KVx402-5-2	36cd	47cde	68d	45cd	0.37bc	202e	
4. KVx402-19-5	36cd	47cde	69cd	79ab	0.10cd	661bcd	
5. IS86-275N	36cd	49bcd	69cd	72abc	0.10cd	283e	
6. B89-504N	35d	47cde	72bc	42d	0.49b	1386a	
7. KVx396-18-10	38ab	50ab	72bc	45cd	0.82a	667bcd	
8. ITN89E-3	37bc	50ab	73ab	55bcd	0.82a	741bc	
9. KVx396-16-10/1	37bc	48bcd	72bc	90a	0.04d	480cde	
10. KB85-18	38ab	46e	71bcd	52bcd	0.21bcd	835b	
2. Checks							
11. TVx3236	39a	49bcd	70bcd	58bcd	0.15cd	472cde	
12. L. (Sampea7)	36cd	53a	76a	50bcd	0.49b	426de	
LSD (5%)	2	2	3	28	0.29	306	
C.V. (%)	3	4	2	32	0.14	33	

2.4. Adaptation to Transition zones

Four sets of the trial were dispatched on request in late May, 1992 to Central African Republic (2), Côte d'Ivoire (1) and Guinea Conakry (1). Feedback was received for all the sets. Feedback was also received from Guinea Bissau for two sets sent to them in May-June, 1991. A description of cultivars is given in Table 2.4.1. Feedback on the trial is reported as below:

Table 2.4.1. Description of cultivars tested in the regional trial for adaptation to transition and coastal zones in 1991-92.

Cultivar	Pedigree	Origin
1. Test cultivars		
1. CR-06-07	(IT82E-32 x Amantin)	Ghana
2. IT86D-641	IT82D-889 x (IT82D-716 x IT81D-1020)	IITA/Ibadan
3. IT81D-1137	(TVx1193-7D x TVu2027)	"
4. IT86D-444	(IT82D-789 x IT82D-716) x IT84E-1-108	"
5. IT85D-3577	(IT82E-60 x TVu801) x TVx1850-01F	"
6. IT82E-16	(TVu201-1D x (TVu37 x TVu530)	"
7. IT82E-18	(TVu1190 x TVu1247) x	"
8. IT83S-818	[(TVx33 x TVu6203) x TVx33-1J] x (TVx6332 x TVu625)	"
2. Check cultivars		
9. IT82E-32	[P33-1C x (TVu410 x SVS-32)] x (TVu1190 x TVu2616)	"
10. Local check	-	-

A. Central African Republic

Cooperator: R.P. Yakende & G.C. Kossibada

The trial was conducted at two locations.

a.1) Poumbaidi

At Poumbaidi (7°8'N, 16°17'E, 602m above sea level), the trial was sown on 16 July, 1992. The plot was not fertilized; cowpea plants were protected against insect pest with insecticide (Bifenthrine) and harvested in late September. The performance of cultivars is given in Table 2.4.2. One test cultivar, IT82E-18, significantly outyielded all other entries in the trial. It was followed by IT81D-1137. But the latter did not differ significantly with the two checks and two test cultivars: CR-06-07 and IT86D-444.

Table 2.4.2. Performance of cowpea cultivars at Poubaidi, Central African Republic in the transition zones in 1992.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
1. Test cultivars	-----DAS-----			---Kg/ha---
1. CR-06-07	38b	43a	65a	570bcd
2. IT86D-641	41a	48a	72a	470cd
3. IT81D-1137	41a	48a	72a	751b
4. IT86D-444	41a	48a	72a	582bcd
5. IT85D-3577	41a	48a	72a	403d
6. IT82E-16	38b	43a	65a	461d
7. IT82E-18	41a	48a	70a	1008a
8. IT83S-818	41a	48a	67a	474cd
2. Checks				
9. IT82E-32	38b	43a	67a	567bcd
10. L. (TVx1948-01F)	41a	48a	72a	697bc
LSD (5%)	0.30	-	-	231
C.V (%)	0.53	-	-	27

a.2) Soumbé

At Soumbé (5-6°N, 17-18°E, 465m above sea level), the trial was sown on July 15, 1992 in an unfertilized plot. Cowpea plants were protected against insect pests with two insecticides: Cypermethrine and Dimethoate, and were harvested in late September-early-October. The performance of cultivars is given in Table 2.4.3. The lowest yielders included the local check: TVx1948-01F, and three test cultivars: IT86D-641, IT83S-818 and IT85D-3577.

B. Côte d'Ivoire

Cooperator: Adou Amalaman

The trial was sown on September 21, 1992 at Bouake (07°44'N, 05°02'W 375 m above sea level) in a plot fertilized with N.P.K. fertilizer at the rate of 30 kg N/ha, 54 kg P₂O₅/ha 54 kg K₂O/ha. Cowpea plants were protected against insect pests with insecticides, Deltamethrine and Dimethoate, and were harvested in early December, 1992. The performance of cultivars is given in Table 2.4.4. Cultivars did not differ significantly from one another.

Table 2.4.3. Performance of cowpea cultivars at Soumbe, Central African Republic, in the transition zones in 1992.

Cultivar	Days to		Seed yield
	Flower bud formation	Flowering	
	-----DAS-----		---Kg/ha---
1. Test cultivars			
1. CR-06-07	43bcd	48a	438abc
2. IT86D-641	46abc	49a	238cde
3. IT81D-1137	42d	47a	584a
4. IT86D-444	47a	51a	459ab
5. IT85D-3577	45abcd	48a	150e
6. IT82E-16	42d	47a	459ab
7. IT82E-18	45abcd	49a	555ab
8. IT83S-818	42d	47a	221de
2. Checks			
9. IT82E-32	42d	47a	438abc
10. Local (TVx1948-01F)	47ab	51a	376bcd
LSD (5%)	3	NS	204
C.V (%)	5	4	36

Table 2.4.4. Performance of cowpea cultivars at Bouake, Côte d'Ivoire, in the transition zones in 1992.

Cultivar	Days to flowering	Seed yield
	-----DAS-----	---Kg/ha---
1. Test cultivars		
1. CR-06-07	45a	1184a
2. IT86D-641	49a	1537a
3. IT81D-1137	49a	1982a
4. IT86D-444	63a	1319a
5. IT85D-3577	62a	1216a
6. IT82E-16	46a	1250a
7. IT82E-18	60a	1462a
8. IT83S-818	45a	1062a
2. Checks		
9. IT82E-32	47a	1101a
10. Local Bouake	63a	1097a
LSD (5%)	NS	NS
C.V (%)	29	42

C. Guinea Bissau

Cooperator: D. Fonseca

The trial was conducted at two locations in 1991.

c.1. Contuboel

At Contuboel (12°12'40"N, 14°33'25"W 8.5m above sea level), the trial was sown on July 30, 1991. The plot was fertilized with 45 kg P₂O₅/ha as triple super phosphate. Cowpea plants were protected against insect pests with two insecticides: Deltamethrine and Dimethoate, and harvested in early October, 1991. The performance of cultivars is given in Table 2.4.5. The local check, Pliplolon, significantly outyielded all other entries. It was followed by the introduced check cultivar IT82E-32, and two test cultivars: IT81D-1137 and IT82E-16.

Table 2.4.5. Performance of cowpea cultivars at Cantuboel, Guinea Bissau, in the transition zones in 1991-92.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
1. Test cultivars	-----DAS-----			--Kg/ha--
1. CR-06-07	39a	50a	71a	445def
2. IT86D-641	38a	52a	66de	396def
3. IT81D-1137	37a	52a	72a	972b
4. IT86D-444	35a	51a	67cd	146f
5. IT85D-3577	37a	52a	66de	225ef
6. IT82E-16	39a	50a	67cd	749bcd
7. IT82E-16	38a	53a	69f	571cde
8. IT83S-818	37a	51a	67cd	302ef
2. Checks				
9. IT82E-32	40a	50a	67cd	888bc
10. Pliplolon	38a	43b	65e	1431a
L.S.D (5%)	NS	3	1	376
C.V. (%)	5	4	1	42

c.2 Ponaté

The trial was sown on June 24, 1991 at Ponate, near Bula in northern Guinea Bissau. The plot was not fertilized; cowpea plants were however, protected against insect pests with an insecticide (Fenitrothons 50 EC) and harvested in early September, 1991. Cultivars experienced poor germination which certainly affected their performance as given in Table 2.4.6.

Table 2.4.6. Performance of cowpea cultivars at Ponate (Bula) Guinea Bissau, in the transition zone in 1991.

Cultivar	Days to		Seed yield
	Flowering	Maturity	
1. Test cultivars	-----DAS-----		-- kg/ha--
1. CR-06-07	52bc	72bc	410a
2. IT86D-641	52bc	72bc	406a
3. IT81D-1137	55b	75b	354a
4. IT86D-444	50c	70c	653a
5. IT85D-3577	52bc	72bc	282a
6. IT82E-16	52bc	70c	528a
7. IT82E-18	52bc	70c	580a
8. IT83S-818	52bc	72bc	135a
2. Checks			
9. IT82E-32	50c	70c	508
10. Pliplolon	100a	100a	111a
L.S.D (5%)	4	4	NS
C.V. (%)	5	3	62

D. Guinea Conakry

Cooperator: F.L. Guilavogui

The trial was sown on September 8, 1992 at Foulaya (10°03'N, 12°52'W, 380m above sea level). The plot was fertilized with N.P.K. fertilizer at the rate of 40 kg N/ha, 40 kg P₂O₅/ha and 40 kg K₂O/ha. Cowpea plants were protected against insect pests with Cypercal-50 insecticide and was harvested in November, 1992. The performance of cultivars is given in Table 2.4.7. The highest yielding cultivars included the introduced check, IT82E-32, and three test cultivars, IT82E-18, IT86D-444 and CR-06-07. The local check: Pkaku Toghoï, together with one test cultivar: IT81D-1137, were amongst the lowest yielding entries.

Table 2.4.7. Performance of cowpea cultivars at Foulaya, Guinea Conakry, in the transition zones in 1992.

Cultivar	Days to			Disease attack		Seed yield
	Flower bud formation	Flowering	Maturity	Bacterial blight	Rust	
1. Cultivars	-----DAS-----			----- (1-5) -----		--Kg/ha--
1. CR-06-07	38a	46a	68b	2.00a	1.00c	948abc
2. IT86D-641	33c	45a	68b	1.00b	1.00c	906bcd
3. IT81D-1137	34bc	48a	72a	1.00b	1.25bc	437e
4. IT86D-444	37ab	49a	74a	1.00b	1.50b	937abcd
5. IT85D-3577	33c	47a	66bcd	1.00b	1.00c	656de
6. IT82E-16	36ab	47a	67bc	2.50a	1.00c	703cde
7. IT82E-18	36ab	46a	67bc	1.00b	1.00c	1250a
8. IT83S-818	34bc	46a	64cd	1.00b	1.25bc	641de
2. Checks						
9. IT82E-32	37ab	47a	67bc	2.25a	1.00c	1031ab
10. L. Pkaku Toghoï	34bc	47a	63d	1.00b	2.25a	562e
LSD (5%)	2	NS	3	0.53	0.47	327
C.V. (%)	4	3	3	27	26	28

2.5. Bruchid resistance trial

Bruchids (*Callosobruchus maculatus*), a storage weevil insect pest, can cause severe damage to stored cowpea grain: 100% losses may be experienced within 3 months after harvest if stored cowpea is not protected against insect pests. Some cultivars have been developed with resistance to the storage weevil by IITA core program. Cowpea International Trial is conducted yearly in order to transfer the newly developed bruchid resistant cultivars to national programs. Four sets of the trials were dispatched through the Cowpea Network to two countries: Central African Republic (3) and Guinea Conakry (1) in 1992. Feedback was received only for the 3 sets from Central African Republic. They are reported below:

a. Central African Republic

Cooperators: C. Ganglaou, R.P. Yakende

The trial was conducted at three locations as below:

a.1) Bambari

At Bambari (5°48'N, 20°40'E, 450 m above sea level), the trial was sown on August 12, 1992. The plot was not fertilized. Cowpea plants were protected against insect pests with Systhoate insecticide and harvested in late October, 1992. Only the field performance of cultivars is given in Table 2.5.1. The highest yielding cultivars included: IT84D-448, IT84S-2446-4, IT86D-364, IT87S-1463b and IT87D-1827.

Table 2.5.1. Field performance of cowpea cultivars resistant to bruchids, a weevil insect pest, at Bambari, Central African Republic in 1992.

Cultivar	Days to			Seed yield --Kg/ha--
	Flower	Flowering	Maturity	
	-----DAS-----			
1. IT87D-1827	41a	44ab	72a	664ab
2. IT86D-1038	38a	43bc	71a	604b
3. IT86D-498	41a	43bc	71a	391c
4. IT86D-364	41a	44ab	72a	708ab
5. IT84D-448	43a	45a	73a	820a
6. IT87S-449	30a	43bc	71a	618b
7. IT87S-1393	40a	43bc	71a	579b
8. IT87S-1463b	41a	44ab	73a	700ab
9. IT84S-2446-4	41a	43bc	71a	756ab
LSD (5%)	NS	1	NS	183
C.V. (%)	16	2	1	19

a.2) Poumbaidi

At Poumbaidi (2-8°N, 16-17°E, 602 m above sea level), the trial was sown on July 18, 1992. Cowpea plants were protected against insect pests with Bifenthrin insecticide and harvested in early October, 1992. The field performance of cultivars is given in Table 2.5.2. The highest yielding cultivar was IT84D-449.

Table 2.5.2. Performance of cowpea cultivars resistant to bruchids, a weevil insect pest, at Poubaidi, Central African Republic in 1992.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	-----DAS-----			--Kg/ha--
1. IT87D-1827	38ab	45b	70a	574b
2. IT86D-1038	39a	46a	67a	603b
3. IT86D-498	37b	44c	67a	369b
4. IT86D-364	39a	46a	70a	405b
5. IT84D-448	39a	46a	70a	401b
6. IT84D-449	37b	41d	67a	862a
7. IT87S-1393	39a	46a	67a	480b
8. IT87S-1463G	39a	46a	70a	526b
9. IT84S-2446-4	39a	46a	67a	511b
LSD (5%)	1	0.5	-	234
C.V. (%)	1	1	-	30

a.3) Soumbe

At Soumbe (5-6°N, 17-18°E, 465m above sea level), the trial was sown on July 15, 1992. The field plot was not fertilized. Cowpea plants were however, protected against insect pests with Cypermethrine and Dimethoate insecticides and harvested in late September, 1992. The performance of cultivars is given in Table 2.5.3. High yielding cultivars were IT87D-1827, IT84S-2446-4 and IT87S-1463G.

Table 2.5.3. Field performance of cowpea cultivars resistant to bruchids, a weevil insect pest, at Soumbe, Central African Republic in 1992.

Cultivar	Days to			Seed yield
	Flower bud formation	Flowering	Maturity	
	-----DAS-----			--Kg/ha--
1. IT87D-1827	43ab	47abc	71a	731a
2. IT86D-1038	45a	48ab	71a	438bc
3. IT86D-498	42b	45bc	71a	438bc
4. IT86D-364	41b	44c	71a	409bc
5. IT84D-448	44ab	46abc	71a	417bc
6. IT84D-449	41b	44c	71a	346c
7. IT87S-1393	43ab	47abc	72a	451bc
8. IT87S-1463b	46a	49a	72a	468abc
9. IT84S-2446-4	42b	45bc	71a	626ab
LSD (5%)	3	4	NS	271
C.V. (%)	5	5	-	39

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