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(OAU/STRC)

Semi Arid Food Grain Researach and Development

(SAFGRAD)

WEST AND CENTRAL AFRICA COWPEA NETWORK

"Reseau Niébé de l'Afrique Centrale et Occidentale"

(RENACO)



RENACO 1992 Regional Striga Resistance and Supplements of other Trials

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Declaration

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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 domaines 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:

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

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 agressive 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, adviseable 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 volum 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.

Tr	ial name	No. of se	ts
		sent ou	t
1)	Adaptation to northern Guinea	savanna 3	
2)	Adaptation to Sahelian-Sudania	n zones 1	
3)	Adaptation to transition zones	4	
4)	Striga resistance	20	
5)	Bruchid insect pest resistance	4	
6)	Aphid insect pest resistance	1	
	Total	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

	Trial name									Total				
	Adaptation			to			Resistance to			IOCUI				
Country	Guinea savanna		Sudan sahel	Sudanian- sahelian		Transition zones		Striga		achids	A	phids		and the second secon
			zones				Cont Facily		Sent Feedb.		Sent Feedb.		Sent	Feedb
	Sent	Feedb.	Sent	Feedb.	Sent	Feedb.	Sent	reeap						
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	-	-	-	-	-	-	-	-	-		8.		-	
Togo	-	-	-	-	-	-	3	1	-	-	-	-	3	I
									1					
Total	2	2	1	1	4	4	20	15	4	3	1	0	32	25

Ι

Regional Striga Resistance TriaL

1. Background

Striga gesnerioides is infesting cowpea in all agroecological zones found in West and Central Africa, particulary 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 involging 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.

Cu	Cultivar		ar Pedigree		Characteristics
1.	Tes	st cultivars			
	1)	KVx164-65-5	(IT82D-716 x KVx30-G467-5-10K)	Burkina Faso	Resistant to bruchids and Striga.
	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 Striga.
	4) 5) 6) 7)	KVx402-5-2 KVx402-19-1 KVx402-19-5 KVx305-118-31	(KVx30-166-3G x B301) - do - - do - (KVx146-27-4 x KVx30-G246-2-5K) (TVu1190 x TVu76) x	- do - - do - - do - - do -	- do - - do - - do - Resistant to Aphids, Bruchids and Striga. Resistant to Bruchids
	0,	11010 771	(TVu2027 x TVu625)	1111, 19444	and Striga.
2.	Re	sistant checks			
	9) 10)	TN5-78 § IT82D-849	Landrace (TVx1193-9F x Emmago) or (TVu1190 x Prima)	Niger/Burkin IITA,Ibadan	a Resistant to Striga. Resistant to Striga.
	11)	B301	Landrace	Botswana	Resistant to Striga
з.	Su	sceptible check			
	12)	IT82E-32	{P33-1C x (TVu410 x SVS-32)] x TVu1190 x TVu2616)	IITA, Ibadan	Early maturing cultivar.

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

§ 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 insectides (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 latters 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.

Cu	ltivar	Days to <i>Striga</i> emergence§ £	<i>Striga</i> density	Seed yield
1)	Test cultivars	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)	Resistant checks			
	TN5-78	89ab	0.04bc	827a
	IT82D-849	100a	0.000	509a
	B301	90ab	0.04bc	576a
3)	Susceptible check	2 2		
	IT82E-32	32c	4.76a	321a
	LSD (5%)	23	0.16	N.S.
	C.V (%)	18	12	33

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

\$ DAS = Days after sowing. f = 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.

Cu	ltivar	<i>Striga</i> density
		and the second
1)	Test cultivars	shoots/m ²
	KVx164-63-5	0.00d
2	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)	Resistant checks	
15 1	TN5-78	0.05d
	IT82D-849	1.10b
	B301	0.690
3)	Susceptible check	
	IT82E-32	3.30a
	LSD 5%	0.25
	C.V. (%)	15

b.1) Kamboinse

At Kamboinse ($12^{\circ}28'N$, $01^{\circ}33'W$, 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 significantlyh 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 latters, 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) <u>Kouaré</u>

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 resitant checks; although KVx291-47-222 and KVx402-5-2 tended to emerge Striga shoot ealier 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.

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

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

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

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

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C) Cameroon

Cooperator: 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.

		Days to maturity	<i>Striga</i> density	Seed yield
Cu	ltivar		-	
1)	Test cultivars	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)	Resistant checks			
	TN5-78	74bcd	0.76a	367a
	IT82D-849	68d	0.00a	913a
	B301	70cd	0.10a	838a
3)	Susceptible check			
	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.

Cu	ltivar	Viral disease attack	<i>Striga</i> density	Seed yield	
		(1.5)		V~/ho	
1)	Test cultivars	(1-5)	shoots/m	kg/na	
	KVx164-63-5 KVx291-47-222 KVx397-6-6 KVx402-5-2 KVx402-19-1 KVx402-19-5 KVx305-118-31 IT81D-994	2.25cd 2.37cd 2.87ab 2.00de 2.50bc 2.62bc 2.37cd 2.87ab	0.35de 0.50cde 1.40cd 5.25a 1.48bc 1.25cd 2.52b 0.05e	987abc 471de 362de 1013abc 629cde 516de 612cde 328de	
2)	Resistant checks				
2	TN5-78 IT82D-849 B301	3.12a 1.00g 1.50f	1.48bc 0.00e 0.00e	259e 1188a 683bcd	
3)	Susceptible check				
	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) Ghana

Cooperator: K.O. Marfo

The trial was established at Manga $(11^{\circ}01'N,00^{\circ}16'W, 249m)$ 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	
ou		Flower buds for- mation	Flowering	Maturity		
1)	Test cultivars -		DAS		-shoots/m ²	-kg/ha-
2)	KVx164-63-5 KVx291-47-22 KVx397-6-6 KVx402-5-2 KVx402-19-1 KVx402-19-5 KVx305-118-31 IT81D-994 <u>Resistant checks</u> TN5-78 IT82D-849	38b 38b 36b 38b 37b 38b 64a 38b 37b	45b 44b 44b 45b 45b 46b 68a 46b	67b 62c 67b 62c 62c 62c 80a	0.96b 0.05d 0.16cd 0.00d 0.44bcd 0.00d 0.32bcd 0.05d	541a 500a 708a 458a 542a 667a 583a 417a 625a 416a
	B301	37b 38b	41b 46b	.62c	0.00d	709a
3)	Susceptible chec	k				
	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) Mali

Cooperator: 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; wheareas 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.

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

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

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.

		Days to		<i>Striga</i> density	Seed yield	
Cu.		Flowering	Maturity			
1)	Test cultivars	DA	S	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	<u>k</u>				
	IT82E-32	49bcd	67a	106.54a	42e	
	LSD (5%)	4	-	16.15	774	
	C.V.(%)	6	-	30	47	

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

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 P_2O_5 /ha as single super phosphate. The performance of entries is given in Table 1.11.

Cultivar			Days to		<i>Striga</i> density	Seed yield
		Flowering	Maturity	First <i>Striga</i> emergence		
1)	Test cultivars		DAS		Shoots/m ²	Kg/ha
2)	KVx164-63-5 KVx291-47-222 KVx397-6-6 KVx402-5-2 KVx402-19-1 KVx402-19-5 KVx305-118-31 IT81D-994 Resistant check TN5-78 IT82D-849 P301	51b 50b 48b 48b 49b 50b 79a xs	75b 74b 61c 61c 62c 62c 66bc 90a 66bc 59c	41c 37c 37c 35c 41c 85ab 34c 44c 34c 100a 72b	2.15de 4.40bc 1.40def 2.90cd 0.38ef 0.16f 5.50ab 0.63ef 1.25def 0.00f 0.10f	918de 835e 1545bc 1336bcd 1482bc 2088a 1148cde 21f 1691ab 939de 1482bc
3)	Susceptible che	eck		25	2.02-	0104-
	1T82E-32 LSD (5%)	45b 10	11	26	1.91	488
	C.V. (%)	13	12	36	29	28

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

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 latters 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.	Performa	ance of	COWP	bea	cultiva	ars in	
		a Striga	a sick	plot	at	Tarna,	near	
		Maradi,	Niger.					

Cu	ltivar	Striga density
1)	Test cultivars:	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)	Resistant checks	
	TN5-78	12.51ab
	IT82D-849	0.00e
	B301	0.05e
3)	Susceptible check	
	IT82E-32	13.25a
	LSD (5%)	2.83
	C.V (%)	24

Cooperator: 0.0. Olufajo & A.A. Zaria

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

g.1) <u>Bakura</u>

At Bakura $(12^{\circ}48'N, 05^{\circ}53'E)$, the trial was sown on August 1, 1992 in a *Striga* sick plot. The plot was fertilized with 36 kg P_2O_5 /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.

Cultivar		Days to		<i>Striga</i> density	Seed	
		Flowering	Maturity			
1)	Test cultivars -	DA	S	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)	Resistant checks					
	TN5-78	48b	56b	0.05ef	484cde	
	IT82D-849	46b	54b	0.00f	424cde	
	B301	46b	54b	0.05f	1879a	
3)	Susceptible check					
	IT82E-32	43b	51b	0.76þ	1023b	
	LSD (5%)	11	9	0.18	499	
	C.V. (%)	15	11	13	56	

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

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, P_2O_5 and K_2O 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.

		Days	to	Viral diseases attack	<i>Striga</i> density	Seed yield
Cu	ltivar	Maturity	First Striga emergence			
1)	Test cultivars	DA	S	-(1-5)-	Shoots/m ²	kg/ha
	KVx164-63-5 KVx291-47-222 KVx397-6-6 KVx402-5-2 KVx402-19-1 KVx402-19-5 KVx305-118-31 IT81D-994	73b 72b 69b 70b 70b 71b 72b 79a	57bc 55bc 64bc 50c 55bc 91a 52c 69b	2.00bc 2.00bc 1.50cde 1.75bcd 2.00bc 2.00bc 2.25b 1.25de	1.33d 0.82de 0.96de 3.10a 0.69def 0.05fg 2.71ab 0.56efg	311bcd 246cd 286bcd 100d 403abc 336bc 269bcd 229cd
2)	Resistant check	<u>(S</u>				
	TN5-78 IT82D-849 B301	71b 69b 70b	52bc 100a 100a	3.00a 1.25de 1.50cde	1.98c 0.00g 0.00g	77d 440abc 501ab
3)	Susceptible che	eck				
	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 1.14. Performance of cowpea cultivars in a *Striga* sick plot at Minjibir, Nigeria in 1992.

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		Days	to	Striga	Sood
Cu	ltivar	Flowering	Maturity	density	yield
1)	Test cultivars	DA	.S	Shoots/m ²	Kg/ha
1	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)	Resistant check	s			
	TN5-78	50abc	68b	6.70abc	822ab
	TT82D-849	49cd	58c	0.00c	622b
	B301	50abc	68b	0.38c	1115a
3)	Susceptible che	ck			
	IT82E-32	49cd	60c	10.39ab	495bc
	LSD (5%)	2	1	9.74	386
	C.V (%)	3	2	56	34

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

Conclusion

Striga infestation

Striga density was significantly affected by location, cultivar and their interaction. Tarna, Niger, and Koporo, 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 (B<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. 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 (B>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 $(shoots/m^2)$ as affected by location and cultivar; and slop (B) 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	Striga density§	ß	r ²
Beederen			10		
- Benin		1. Test cultivars			
. 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					
. Manga	0.42d	2. Resistant checks			
- Mali		. TN5-78 (Suvita-2)	1.76bc	1.92**	0.90
. Cinzana	1.01cd	. IT82D-849	0.12c	-0.12**	0.13
. Koporo	4.12a	. B301	0.22c	0.14**	0.13
- Niger					
. Konni	1.81bc	3. Susceptible check			
. Tarna	4.72a	. IT82E-32	6.82a	1.69	0.41
- Nigeria					
. Bakura	0.26d	LSD (5%)	0.19	-	-
. Minjibir	1.10cd	C.V. (%)	34	-	- 1
- Togo		• •			
. Bissare	2.79b				
LSD (5%)	1.30				
C.V.(%)	34				

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

Cultivar	var Pedigree		Characteristics
1. Test cultivars			
1. CR-06-07	(IT82E-32 x Amantin)	Ghana	
2. KVx305-2-118-23-3	<pre>81 (KVx146-27-4 x KVx30-G246-2-5K)</pre>	Burkina Faso	Resistant to Aphids, Bruchids and <i>Striga</i>
3. KVx305-118-31	- do -	- do -	- do -
4. KVx402-5-2 5. KVx402-19-1	(KVx30-166-3G x B301) - do -	- do - - do -	Resistant to <i>Striga</i> - 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 Striga
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	-	-	-

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

a) <u>Guinea Bissau</u>

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

 P_2O_5 /ha as triple super phosphate. Cowpea plants were not protected against insect pests and ware 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.

			Days to		Seed
Cultivar		var Flower F bud formation		Flowering Maturity	
1. <u>Tes</u>	st cultivars		DAS		Kg/ha-
1.	CR-06-07	38ab	50a 77a	74a 84a	829b 30e
3.	KVx305-118-31 KVx402-5-2	39ab 35c	53a 49a	72a 68a	92de 1106ab
5.	KVx402-19-1 IAR7/180-4-5	38b 35c	52a 72a	70a 87a	836b 80e
7.	IAR7/180-4-5-1 KVx398-7-1	35c 40a	71a 75a	82a 85a	137de 17e
9.	KVx396-4-5-2D	39ab	47a	70a	1245a
2. <u>Che</u>	ecks				
10. 11. 12.	KN-1 (Vita-7) TVx3236 Pliplolon	38b 40a 35c	52a 52a 46a	70a 71a 68a	489c 406cd 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 $(10^{\circ}23'N, 9^{\circ}15'W)$ 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.

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

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

c) Nigeria

Cooperator: 0.0. 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.

	Days	to	Alectra density	Seed yield
Cultivar	Flowering	Maturity	-	
1. <u>Test cultivars</u>	DP	S	shoots/m²	kg/ha
1. CR-06-07 2. KVx305-2-118-23-2 3. KVx305-118-31 4. KVx402-5-2 5. KVx402-19-1 6. IAR7/180-4-5 7. IAR/7180-4-5-1 8. KVx398-7-1 9. KVx396-4-5-2D	61a 57a 54a 58a 55a 63a 61a 55a 60a	90a 88a 90a 91a 88a 91a 95a 87a 90a	0.21ef 2.13a 1.56b 0.21ef 1.31bc 0.56d 1.40b 0.04f 0.37de	1313abcd 1292bcd 986cde 937de 685e 1431abc 1494abc 1398bacd 1513ab
2. Checks				
10. KN-1 (Vita-7 11. TVx3236 12. Local (IAR 48)	57a 57a 63a	88a 88a 92a	0.04f 1.10c 1.31bc	1773a 1083bcde 1479ab
LSD (5%)	NS	NS	0.29	463
C.V. (%)	8	4	14	25

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

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:

Cultivar		Pedigree	Origin	Characteristics
1. <u>Te</u> 1.	est cultivars KVx396-4-5-2D	(IAR1696 x Vita-7) x	Burkina	Adapted to the Sahel, Sudan
2.	KVx164-41-64	(1T82D-716 x) KVx30-G467-5-10K)	- do -	Resistant to bruchids & Striga
3.	KVx402-5-2	(KVx30-166-3G x B301)	- do -	Adapted to the Sahel & Sudan savanna & resistant to Striga
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. <u>Cl</u>	heck cultivars			
11.	KVx3236	(TVx1509 x Ife brown)	IITA	Adapted to the Sahel, Sudan and Guinea savannas.
12.	Local check		-	-

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

a) Nigeria

Cooperator: 0.0. 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 P_2O_5 /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.

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

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

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:

Cultivar		Pedigree	Origin	
1.	Test cultivars			
	1. CR-06-07	(IT82E-32 x Amantin) IT82D-889 x (IT82D-716 x	Ghana	
	21 11000 011	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 7. IT82E-18 8. IT83S-818	(TVu201-1D x (TVu37 x TVu530) (TVu1190 x TVu1247) x [(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	-	-	

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

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.

Cultivar			Seed yield		
		Flower bud formation	Flowering	Maturity	
1. Test	cultivars		DAS		Kg/ha
1. C 2. I 3. I 4. I 5. I 6. I 7. I 8. I	R-06-07 T86D-641 T81D-1137 T86D-444 T85D-3577 T82E-16 T82E-18 T83S-818	38b 41a 41a 41a 38b 41a 41a	43a 48a 48a 48a 43a 48a 48a 48a	65a 72a 72a 72a 72a 65a 70a 67a	570bcd 470cd 751b 582bcd 403d 461d 1008a 474cd
2. <u>Chec</u>	ks				
9. 1 10. I	T82E-32 . (TVx1948-01F	38b 5) 41a	43a 48a	67a 72a	567bcd 697bc
I	LSD (5%)	0.30	-	_	231
C	C.V (%)	0.53	-	-	27

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

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-O1F, 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 $(07^{\circ}44'N, 05^{\circ}02'W 375 \text{ m}$ 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.

		Day	Seed yield	-	
Cultivar		Flower bud formation	Flowering		
1	et cultivare		DAS	Kg/ha	-
T. Tes	st cultivals				
1.	CB-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. <u>Ch</u>	ecks				
Q	TT82E-32	42d	47a	438abc	
10.	Local (TVx1948-01F)	47ab	51a	376bcd	
	LSD (5%)	3	NS	204	
	C.V (%)	5	4	36	

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

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
1	t cultinanc	DAS	Kg/ha
1. <u>1e</u>	st cultivals		
1. 2. 3. 4. 5. 6. 7. 8.	CR-06-07 IT86D-641 IT81D-1137 IT86D-444 IT85D-3577 IT82E-16 IT82E-18 IT83S-818	45a 49a 63a 62a 46a 60a 45a	1184a 1537a 1982a 1319a 1216a 1250a 1462a 1062a
2. <u>Ch</u>	ecks		
9. 10.	IT82E-32 Local Bouake	47a 63a	1101a 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 ($12^{\circ}12'40$ "N, $14^{\circ}33'25$ "W 8.5m above sea level), the trial was sown on July 30, 1991. The plot was fertilized with 45 kg P_2O_5 /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.

- 11.		Days to			
Cultivar	Flower bud formation	Flowering	Maturity		
1. Test cultivars		DAS		Kg/ha	
1. CR-06-07 2. IT86D-641 3. IT81D-1137 4. IT86D-444 5. IT85D-3577 6. IT82E-16 7. IT82E-16 8. IT83S-818	39a 38a 37a 35a 37a 39a 38a 37a	50a 52a 51a 52a 50a 53a 51a	71a 66de 72a 67cd 66de 67cd 69f 67cd	445def 396def 972b 146f 225ef 749bcd 571cde 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	

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

c.2 Ponaté

The trial was son 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.

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

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

D. Guinea Conakry

Cooperator: F.L. Guilavogui

The trial was sown on September 8, 1992 at Foulaya ($10^{\circ}03'N$, $12^{\circ}52'W$, 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.

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

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

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 culivars 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°40E, 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 cultiva:	rs resistant to bruchids
		a weevil insect pest	at Bambari, Co	entral African Republic
		in 1992.		

Cultivar		Days to			Seed vield
cu.		Flower	Flowering	Maturity	-
_			DAS		Kg/ha
1.	TT87D-1827	41a	44ab	72a	664ab
2.	TT86D-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.	IT875-449	30a	43bc	71a	618b
7.	TT875-1393	40a	43bc	71a	579b
8.	TT875-1463b	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 labove sea level), the trial was sown on July 18, 1992. Cowpea plants were protected protected against insect pests with Bifenthrine 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.

			Seed yield		
Cultivar		Flower bud formation	Flowering	urity	
			DAS		Kg/ha
1.	IT87D-1827	38ab	45b	70a	574b
2.	IT86D-1038	39a	46a	67a	603b
3.	TT86D-498	37b	44c	67a	369b
4.	TT86D-364	39a	46a	70a	405b
5.	IT84D-448	39a	46a	70a	401b
6.	IT84D-449	37b	41d	67a	862a
7.	TT875-1393	39a	46a	67a	480b
8	TT875-1463G	39a	46a	70a	526b
9.	IT84S-2446-4	39a	46a	67a	511b
	LSD (5%)	1	0.5	-	234
	C.V (%)	1	1	-	30

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

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.

		Days to			Seed yield
Cultivar		Flower bud formation	Flowering	Maturity	
-			DAS		Kg/ha
1.	TT87D-1827	43ab	47abc	71a	731a
2	TT86D-1038	45a	48ab	71a	438bc
3	TT86D-498	42b	45bc	71a	438bc
4	TT86D-364	41b	44c	71a	409bc
5	TT84D-448	44ab	46abc	71a	417bc
6	TT84D-449	41b	44c	71a	346c
7	TT875-1393	43ab	47abc	72a	451bc
8	TT875-1463b	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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