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Collection of Arachis in Brazil

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ICRISAT

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C O N T E N T S

COLLECTION OF *ARACHIS* GERMPLASM IN BRAZIL

(March 1982)

V. Ramanatha Rao*

SUMMARY AND CONCLUSIONS

During March 1982, ICRISAT participated in a groundnut (*Arachis*) germplasm collection mission in Brazil organized by Centro Nacional de Recursos Geneticos (CENARGEN) of Empresa Brasileira de Pesquisa Agropecuaria (EMBRAPA), Brazil. The main objective of the mission was to search and collect wild species of *Arachis* in the northern Goias province of Brazil. Based on information available earlier the mission was timed in the month of March. Excellent planning and organization by CENARGEN made the mission a successful one. The trip lasted three weeks and a total of 51 *Arachis* samples and 157 samples of various grasses and legumes were collected (Table 1).

This trip exemplified the nomenclatorial difficulties with *Arachis*. Every trip so far produced some surprises and question marks. A new distribution pattern for sect. *Extranervosae* was established. *A. burchellii* extends all the way to Imperatriz in the north. *Arachis marginata*, an incompletely known species, no longer present in living collections, was located and collected. Possibly a new species in section *Triseminale*, and one in section *Arachis* were collected.

The second part of the trip was concerned with a visit to Caribbean Research and Development Institute (CARDI). St. Augustine, Trinidad, for exploring the possibility of collection of groundnut germplasm in the Caribbean and

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Table 1. Summary of *Arachis* germplasm collected in Brazil - March 1982

State	Section	Species	No. of accessions		Remarks
			Seed or plants	Herbarium only	
Wild	*Extranervosae*	*lutescens*	1	-	-
"	"	*prostrata*	2	2	-
"	"	*burchellii*	18	3	-
"	"	*sylvestris*	2	1	-
"	"	*marginata*	2	-	-
"	"	?	10	-	Close to *prostrata* & *burchellii*
"	*Triseminale*	?	1	-	Unidentified-new species?
"	*Arachis*	?	2	-	-do-
Cultivated	"	*hypogaea* ssp. *fastigiata* var. *fastigiata*	5	-	Market samples
		var. *vulgaris*	2	-	-do-
		Total:	45	6	

also collecting information on pigeonpea cultivation in that area. Dr. S.Q. Haque was the contact person at CARDI and discussions with him lead to formulation of a collection strategy for groundnut in the countries where CARDI has an active program. This will be aided by various research workers in this area, and the germplasm collected will be sent to ICRISAT for evaluation and maintenance purposes. The information obtained on pigeonpea cultivation will help formulating plans for collection in this region.

INTRODUCTION

Brazil is an important area of diversity for *Arachis* and the Genetic Resources Unit of ICRISAT has recognized Brazil as an important source of

Arachis germplasm. Several regions were covered in the past by various workers: Prof. Krapovickas, Drs. Gregory, Hammons, Simpson, Langford. However, exploration of some areas in Brazil including the northern part of Goias has not been extensive. For this purpose CENARGEN had proposed several field trips in Brazil and International Board for Plant Genetic Resources (IBPGR) agreed to finance these expedition. The trip in which I participated was the third in the series of collection trips proposed by CENARGEN. Discussions between CENARGEN and GRU in 1981 resulted in this joint germplasm collection in Brazil. While the cost for other collectors was covered by an IBPGR grant, all my expenses were covered by ICRISAT.

COLLECTING TEAM

Dr. Jose F.M. Valls, Curator, CENARGEN/EMBRAPA, Brasilia, Brazil.
Prof. A. Krapovickas, Universidad Nacional del Nordeste, Corrientes, Argentina.
Mr. G.P. Silva, Agric, Technician, CENARGEN/EMBRAPA, Brasilia, Brazil.

COLLECTION STRATEGY

The present collection was launched in the month of March based on the information available on the wild species in this region. As this was not a season for cultivated groundnut, we could only get a few samples from the markets. In case of the wild species the seeds were collected from as many plants as possible in order to obtain population samples. However, when the differences were very obvious plants were collected separately. In wild *Arachis* the pods are small and are spread over a large area around the plant, sometimes pegs going away as far as 40 cm from the node. We had to dig up quit a

bit of the soil and sift it carefully for the small pods. If the soil was wet it was more difficult. If water was available we could wash the soil and find the pods, otherwise we used to carry sacks full of soil and sift later on. We also made herbarium specimens and took living plants to be planted in the net house at CENARGEN.

ACKNOWLEDGEMENTS

Many persons have been responsible for the success of the present mission. I wish to acknowledge their help and guidance and thank the following in particular.

National Research Council and Empresa Brasileira de Pequisa Agropecuaria (EMBRA), Brazil, for granting the necessary permission to participate in the collection.

Dr. D.C. Giacometti, Chief, CENARGEN/EMBRAPA, Brasilia for his leadership and guidance in Brazil.

Dr. Lidio Coradin, Coordinator (collection) CENARGEN/EMBRAPA for his guidance.

Dr. Jose F.M. Valls, Curator, CENARGEN/EMBRAPA for the excellent planning and organization and personal help and guidance during my stay in Brazil.

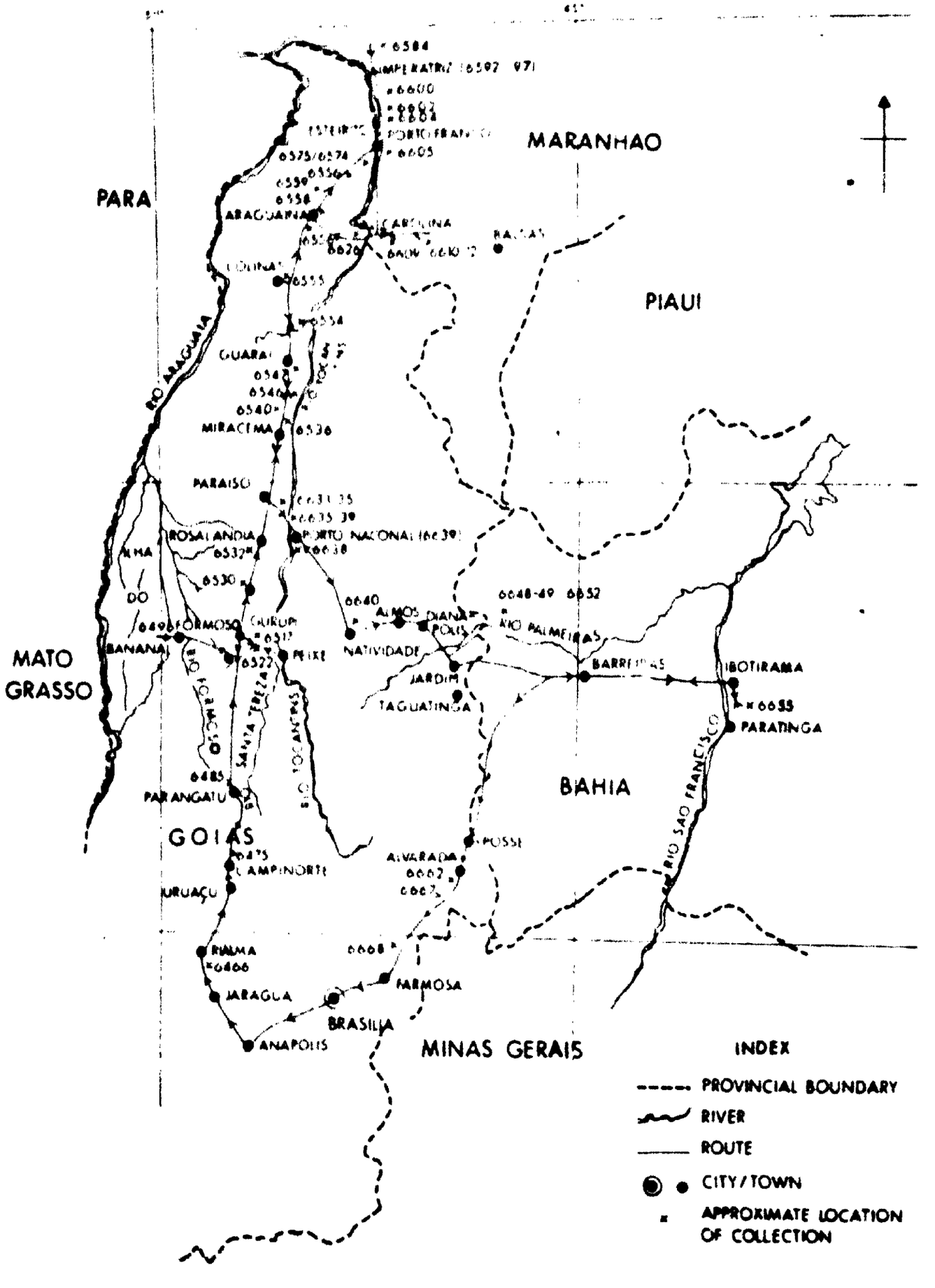
Prof. A. Krapovickas, Argentina for his kind cooperation, guidance and information.

Mr. Glocimar P. Silva, Agrl. Technician, CENARGEN, for his able driving and assistance.

Ms. Lucia M. Paula, Secretary, CENARGEN, for making travel arrangements.

Dr. S.Q. Haque for his help and cooperation during my visit to CARDI, Trinidad and Tobago.

ROUTE FOLLOWED IN ARACHIS COLLECTION MISSION IN BRAZIL
MARCH 1982



Many others whose names are not listed above helped in the mission and made my stay in Brazil and Trinidad a pleasant one. Their help is gratefully acknowledged.

ITINERARY
1982

23/2	Hyderabad - Bombay
24/2	Bombay - London - Rio de Janeiro
25/2	Rio de Janeiro - Brasilia
26/2	Brasilia - CENARGEN
27/2	Brasilia
28/2	Brasilia (A. Krapovickas arrived)
1/3	Brasilia - CENARGEN
2/3	Brasilia - Anapolis - Jaragua - Rialma - Uruacu
3/3	Uruacu - Campinorte - Parangatu - Gurupi
4/3	Gurupi - Formoso - Ilha do Bananal - Gurupi
5/3	Gurupi - Rio Santa Teresa - Pexie - Gurupi
6/3	Gurupi - Rosalandia - Paraiso do Norte
7/3	Paraiso do Norte - Miracema do Norte - Guarai
8/3	Guarai - Colinas - Araguaina
9/3	Araguaina - 3 km South - Araguaina
10/3	Araguaina - Esteirito - Porto Franco - Imperatriz
11/3	Imperatriz - 20 km N - Imperatriz
12/3	Imperatriz - Carolina
13/3	Carolina - Road to Balsas - Carolina - Filadelfia - Araguaina
14/3	Araguaina - Colinas de Goias - Brasilandia - Paraiso do Norte
15/3	Paraiso do Norte - Porto Nacional
16/3	Porto Nacional - Natividade - Dianapolis
17/3	Dianapolis - Novo Jardim - Barreiras
18/3	Barreiras - Ibotiram
19/3	Ibotirama - Road to Paratinga - Ibotirama
20/3	Ibotirama - Barreiras - Posse
21/3	Posse - Farmosa - Brasilia
22-23/3	Brasilia (CENARGEN)
24/3	Brasilia - Rio de Janeiro - Miami
25/3	Miami - Port of Spain - St. Augustine
26/3	St. Augustine (CARDI)
27/3	St. Augustine - Port of Spain
28/3	London - Bombay
29/3	Bombay - Hyderabad

TRAVEL AND TECHNICAL NOTES

Tuesday 23 - February: Hyderabad - Bombay

Wednesday 24 - February: Bombay - London

Weather conditions in London delayed my arrival there which made me miss my onward flight to Port of Spain and forced me to change my flight. So I went to Rio de Janeiro instead.

Thursday 25 - February:

Reached Rio around 0830 hrs and passed through immigration and customs without much difficulty. Took the shuttle to Brasilia and called CENARGEN from the airport. Dr. Jose F.M. Valls, germplasm curator (including for *Arachis*) drove me to Hotel Bristol. He informed that Prof. Krapovickas would be in Brasilia on 28th.

Friday 26 - February:

Went to CENARGEN along with Dr. Valls. We spent the morning looking at material in the screenhouse. They have some problems with insects and diseases in the screenhouse. Dr. Valls showed me the material collected during his last trip that was being maintained in the screen house.

Later I met a number of scientists at CENARGEN. Dr. Giacometti was away in Rome attending an IBPGR meeting. I briefly met Dr. S.R.F. Fagundes, Administrative Director, and Dr. Jairo Silva, Technical Director. I spent some time talking to Dr. E.A.V. Morales about documentation at CENARGEN. They are

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doing commendable work in documentation. Later I met Dr. Magaly Wetzel who is in-charge of the seed technology lab. She showed me around explaining some of the proposed research projects. I also met Dr. Lidio Coradin, Coordinator for germplasm collection. Dr. S.C. Coutinho, who is in charge of forest germplasm, explained to me some of the work they were doing on identification of duplicates using electrophoretic techniques. Later I met Dr. Rodolfo Godoy (who worked on pod rot problem in groundnut at Texas A&M University), Seed Conservation Officer, and talked to him in detail about the long-term cold storage facility that was almost ready. The storage facility appeared to be well planned. Dr. Godoy promised me to get me a copy of the floor plan. I also met Dr. L.A.B. de Castro, Coordinator of the project on genetic engineering, for which the laboratory facilities were under construction/installation. I also met Mr. Glocimar Pereira da Silva, Agricultural Technician,who would do the driving for the current expedition.

Later I met Dr. Hans from IITA who had come to Brazil to formulate a cooperative project on collection of parasites of mealy bugs of cassava.

Saturday 27 - February:

Brasilia sightseeing along with Dr. Hans (IITA).

Sunday 28 - February:

Dr. Valls took us around Brasilia. Prof. Krapovickas arrived in the evening and we three discussed the itinerary plans.

Monday 1 - March:

Went to CENARGEN along with Krapovickas. We spent the forenoon in the screenhouse looking at the *Arachis* collection and taking notes for identification of some of the material collected during 1981. Later we both met Dr. Giacometti briefly. Then we spent most of the time in the herbarium. I met Dr. Ravi Datt Sharma, who works in the Cerrado Research Center. He informed me that they were trying to grow chickpea in Brazil. It seems chickpeas mature in about two months under Brazil conditions. Later we went to encash our traveller cheques as it would be difficult to do so en route. Meanwhile Glocimar packed the vehicle, a Toyota Land Cruiser (assembled in Brazil, slightly smaller than the usual version and with only two doors) with all the items needed for collection.

Tuesday 2 - March (Collections: VKRS 6461-6466*)

We left Brasilia at about 0930 hrs on the Brasilia - Belem highway with the main objective of getting away from urban area as quickly as possible. We passed through Anapolis, Jaragua and Rialma reaching Uruacu by night. After Jaragua we stopped to look for *Arachis* which was observed by other collectors during last year. At the edge of a 'cerrado#' we found three plants but found no fruits. We found full grown plants near the river Saraiva. We dug up the soil around the plants and sifted it in a large sieve (as used for mining semi-precious stones in Brazil) and obtained about 125 pods which took about two hours. This was identified by Krapovickas as *Arachis lutescens* (VKRS 6466). About 5 km

*VKRS = Valls, Krapovickas, Ramanath and Silva. Numbering continued from 6461 to 6669.

#Cerrado = Broad leaved scrub savanna on very poor soils comprising of small low trees (xerophyllous) and grass.

south of Ceres we looked for a population of *Arachis lutescens* collected by Gregory and Krapovickas during 1959, but failed to locate it.

I noticed insect damage on the leaves of plants collected. A few dark brown, necrotic spots were also observed though no sporulation could be seen. Nodulation was poor and nodules were very small. We made herbarium specimens of *Arachis lutescens* as well as other interesting plants such as *Thrasya* sp., *Sporobolus* sp., *Manihot tripartita*, and *Stylosanthes guianensis*.

Wednesday 3 - March (Collections: VKRS 6467-6487)

Left Uruacu at about 0730 hrs on the road to Belem. Noticed large farms of rice and soybean. I was told that most of the large scale farmers in this area have come from southern states. After Brasilia was built as new capital of Brazil, there has been a strong migration from the south and the coast towards the west, as agriculture was extended to the 'Cerrado' region. At 5-6 km N of Campinorte we found an '*Arachis* forest' where *A. prostrata* was growing abundantly (VKRS 6475) as the main component of the sub-surface vegetation. The plants were young so we could collect only four pods, but many live plants and herbarium specimens. Brown spots with dark brown or black ring and also brown necrotic portions, which were round to irregular in shape, were observed on the leaves. At the same site we collected seed and herbarium of *Manihot pruinosa* and made herbarium specimens of *Zornia* sp., *Stylosanthes gracilis*, *Centrosema venosum*, *Vigna* sp., *Eriosema* sp., *Mesosetum* sp., *Axonopus* sp., and *Peltea speciosa*.

Arachis prostrata (VKRS 6485) was found at the road side at km 384 on BR 153. The soil along the road was obviously transported at the time of road construction so we looked around where the soil was bulldozed from and we found it in the nearby cerrado along the 'Corrego* Funil'. We obtained some pods and took live plants as well as herbarium specimens. I noticed small, round to irregular dark brown spots (similar to pepper leafspot) some times coalescing to large necrotic portions. I also noticed sporulation, possibly *Cercosporidium personatum*. A few plants had a light yellow mosaic pattern on the leaves similar to mite damage.

At this site we also collected seed of *Manihot sparsifolis*, *M. tripartita*, and *M. anomala* and took herbarium specimens of *Thrasya* sp. *Actinoladum verticillatum*, and *Dioclea* sp. We reached Gurupi by 2030 hrs.

Thursday 4 - March (Collections: VKRS 6488-6513)

Left Gurupi towards the river Formoso. Looked for *Arachis* at many places and 20 km after Formoso do Araguaia, in a low land at the right side of the road near Rio Javae, we found *Arachis burchellii* (VKRS 6496) in a cerrado. Collected about 50 seeds after much digging and sifting along with some living plants. Leaves had necrotic spots similar to those on VKRS 6485. The plants were heavily infested by woolly aphids. Then we went towards 'Ilha do Bananal' which is formed by the two branches of the river Araguaia with a lot of marshy land. The situation here is something similar to 'Gran Pantanal' of the Mato Grosso where *Arachis* has adapted to grow in periodically flooded areas. We searched

*Corrego = small clear water stream or creek.

this area for *Arachis*, but failed to find any. In this region land is being developed and canals built for large scale cultivation of rice. We made here herbarium of *Axonopus* sp., *Schizachyrium* sp., *Thrasya* sp., *Manihot pruinosa* (seed also) and *Centrosema* sp., and many other grass species. We returned to Gurupi by about 2200 hrs.

Friday 5 - March (Collections VKRS 6514-6522)

Left Gurupi at about 0900 hrs, after buying a couple of sieves for sifting soil. We went towards Peixe, on the bank of river Tocantins. On the way, after the river Santa Teresa, we found a population of *Arachis* sp. (VKRS 6517) in a cerrado. We could not get any seed, so we took living plants and made herbarium specimens. At 2.6 km SE of Rio Santa Teresa we found another population of *Arachis* sp. (VKRS 6522) (Fig.6&8), and got a few pods from this site. On these plants I observed some peculiar looking dark brown pustules in a linear fashion in the interveinal area. These pustules or spots were raised and fell off when rubbed. It started to rain and it was raining for the most of the afternoon. We went upto Rio Tocantins near Peixe and searched for *Arachis* along the west bank of the river. We returned to Gurupi by about 1930 hrs repressed the herbarium specimens and dried them on a kerosene drier. This day we prepared herbarium specimens of *Indigofera* sp., *Manihot pruinosa* (seed also), *Eriosema* sp. and a few other grasses.

Saturday 6 - March (Collections: VKRS 6523-6532)

We left Gurupi towards Paraiso do Norte. At 42 km N of Gurupi (BR 153) we found an *Arachis* population (VKRS 6530) which looked like A. *burchellii*, but

Krapovickas was not sure. The leaflets were slightly larger. Noticed dark brown spots and dark necrotic regions on the leaves. Irregular lesions with yellow margins were noticed and on such plants the terminal bud had wilted (TSWV?). Some infestation by woolly aphids was observed. We collected a few seeds as well as living plants and made herbarium specimens. Here I clearly saw roots on pegs and nodules on such roots. Later on it started raining heavily. We stopped near a river and under the shade of the bridge, we sifted the soil collected earlier (VKRS 6496, 6530) for more seed.

We observed *Arachis* growing just out side the village Rosalandia which was obviously growing in the transported soil. After much walking in the cerrado nearby we found *Arachis burchellii* (VKRS 6532). We collected some seed and took about 100 kg of soil in polythene bags to be sifted later on for seed. The leaves had small black spots and some leaf eating insect damage. The plants were chlorotic and very pale. Nodulation was very poor. On this day we pressed herbariums of *Manihot tripartita* (seed also), *Peltea riedelii*, *P. acutifolia*, *Helicteres* sp., *Dioscorea* sp. and a few others belonging to the family Gramineae. We reached Paraiso de Norte by about 2000 hrs.

Sunday 7 - March (Collections: VKRS 6533-6547)

By 0800 hrs we were on the road again in rainy weather. We looked for *Arachis* on the way at many spots but could not find any. At km 840 in a marshy area where acquatic plants such as *Heliconia* sp. and other Maranthaceae were growing in a babacu palm (*Orbignya* sp.) grove, we found *Arachis* (VKRS 6536) growing (Fig.1) abundantly. From the acquatic plants growing around, it could safely be assumed that this area would be wet throughout the year. Krapovickas said that he had

never seen *Arachis* growing in such an acquatic environment. The whole *Arachis* plant was sub-merged in running water. This could belong to section *Caulorhizae* (with roots at nodes and hollow stem) but the flowers were very small and could be annual. Krapovickas was not sure. However, this turned out to be in section *Arachis* and quite probably series *Annuae* according to Krapovickas when he examined the material again in May 1982. We collected about 300 seeds and pressed herbarium specimens. I observed clear symptoms of *Cercospora arachidicola*.

One km N of Rio dos Bois in a grassy area we located A. *burchellii* (VKRS 6540). This was in very shallow soil, rather small pieces of gravel in the closely knit roots where the pods developed, on top of rock I observed symptoms of TSWV (watery markings on the terminal leaves) but did not notice bud necrosis. Again, as in the case of VKRS 6522, noticed inter-veinal pustules. We could find only a few seeds so we took living plants and made herbarium specimens.

We found A. *burchellii* (VKRS 6546) growing along the road in transported soil 25 km south of Rio Tabocao. We searched all around but failed to find any-more of this growing. This could have come from far away. Just at about 2 km from Guarai we found a small isolated patch of A. *sylvestris* (VKRS 6547). We collected plenty of large and beaked fruits. Here I noticed leaf blight and terminal bud necrosis, but no other symptoms. As we did not find any open flowers at this time we decided to return the next day to the same site. We made herbarium specimens of *Manihot* sp. (seed also), *Dioscorea* sp., *Heliconia* sp., *Cassia* sp., *Pennisetum* sp. etc..

Monday 8 - March (Collections: 6548-6555)

In the morning, we went back to the site of collection of VKRS 6547. From the flowers Krapovickas confirmed that it was indeed A. *sylvestris*. Then we left for Araguaina. In a farm at Rio Feio on BR 153 we observed a population of A. *burchellii* (VKRS 6554). As the time was running short we marked the site to collect on the way back. Again, after 18 km of Colinas de Goias, we found another population of A. *burchellii* (VKRS 6555). We took herbarium specimens and three sacks full of soil to be sifted later on. We reached Araguaina by about 2030 hrs. We made herbarium specimens of *Paspalum* sp., *Thrasya* sp., *Manihot esculenta*, *Dioscorea* sp. (seed also), and *Galactia* sp.

Tuesday 9 - March (Collections: 6556-6557)

It started to rain in the morning. Glocimar took the vehicle to an 'Oficina' (garage) for a check-up as it was heating up very fast. The vehicle would be ready only 1600 hrs. We took the opportunity to dry the herbarium specimens and to rest. Late in the afternoon we went 3 km south of Araguaina, where a population of A. *burchellii* (VKRS 6556) was located by other collectors. We could find this, collected seed and pressed herbarium specimens. Here, as water was available, we sifted the soil collected the previous day. We also made herbarium specimen of *Sida cerradoensis*.

Wednesday 10 - March (Collections: VKRS 6558-6585)

We left Araguaina for Imperatriz in brighter weather. At about 5 km from Araguaina, just after police check post on BR 226, we found a population of *Arachis burchellii* (VKRS 6558). The plants were very green and healthy. We made

herbarium specimens and took living plants in *Sphagnum* moss as we could not find any seed after much digging and sifting.

At 17 km SW of Vanderlandia (BR 226) we came across another population of *A. burchellii* (VKRS 6559), again clean and healthy. We collected seed and specimens for herbarium. We found *A. burchellii* (VKRS 6566) again in a 'Fazenda' (farm), and collected plenty of seeds. I observed symptoms of *Cercospora arachidicola*. At 39 km NE of Vanderlandia (on BR 226) we found *A. burchellii* (VKRS 6574) and *A. sylvestris* (VKRS 6575) growing together. Krapovickas informed that it was the first time he had seen the two species together (Fig.3). These two species have not been available so far and so their cross-compatibility is not known. It will be interesting to see if any intermediates come out of the seed collected at this site. We collected enough seed from both the populations and also from a population of *A. sylvestris* which was growing pure across the road about 200 m south of the site where both species were growing together. While *A. burchellii* was free of any pests and diseases noticed severe leaf webber damage on *A. sylvestris*. We collected samples for herbarium of *Paspalum* sp. (8), *Centrosema* sp. (2), *Stylosanthes* sp., *Manihot* sp. (3), *Coix lacryma-jobi*, *Digitaria* sp., *Panicum* sp., *Axonopus* sp., and a few unidentified plants. We reached Imperatriz at about 2100. The vehicle was heating up badly again.

Thursday 11 - March (Collections: VKRS 6586)

It started to rain again and Glocimar took the vehicle to a garage. We checked the herbarium material, cleaned the seeds collected so far and completed notes. When the vehicle became available at 1600 hrs, we went north

about 20 km and searched for *Arachis* at some spots. Finally in Fazenda Santa Maria we spotted A. *burchellii* (VKRS 6586) in full bloom. As we could not recover any seed, we took plants in Sphagnum and made herbarium specimens. I noticed good nodulation.

Friday 12 - March (Collections: VKRS 6587-6608 and 6669)

Valls made a telephone call to CENARGEN to find out the position on my tickets and made further arrangements for re-routing via Port of Spain. As all this took some time, we had an early lunch and then set off towards Carolina. At the Carolina market we obtained four types of var. *fastigiata* (valencia) (VKRS 6592, 6593, 6594, 6595) and two types of var. *vulgaris* (spanish). One of the spanish types had tan-colored seed (VKRS 6596) while the other was red (VKRS 6597). We also found few large two seeded pods mixed in this lot. Valls also bought six samples of *Phaseolus lunatus* seed (VKRS 6587-91 and 6669).

Near the bridge on the Rio Bananal we found *Arachis burchellii* (VKRS 6600) growing abundantly, about the same location where Dr. Lidio had collected specimens earlier (Coradin 3669). This population was completely masked by *Cassia* sp. and we could locate it only because it was in full bloom. As we could find only a few seeds after much digging, we took plants in moss as well as herbarium specimens. Lateron, at km 1303 along BR 010 (40 km S of Imperatriz) we found A. *burchellii* again (VKRS 6602), without pods.

We also checked in a marshy area 1 km to the south of the same road where A. *burchellii* was collected earlier and took samples of it for herbarium only

(VKRS 6604). We found this species again (VKRS 6605) growing in pure sand. We could collect many seeds. Throughout this area A. *burchellii* varied in its behaviour: in some places it was in full bloom while in other locations we found plenty of mature seeds. This may reflect genetic variation for maturity or adaptation to ecological differences. Just before the bridge on River Tocantins we took the diversion to Carolina and from here on the road became worse. We also made herbarium specimens of *Cassia* sp., *Galactia* sp., *Pennisetum* sp., and *Centrosema* sp. (2). We reached Carolina at about 2100 hrs.

Saturday 13 - March: (Collections: VKRS 6609-6626)

In the morning we went to the local market. We could not find any groundnuts, but Valls bought some lima beans (*Phaseolus lunatus*, VKRS 6613 to 6625). Two duplicate accessions of an *Arachis* were recorded at 12 km and at 120 km on the road to Balsas. We wanted to check this one. Even just after Carolina we found *Arachis* growing abundantly on the sides of the road, probably A. *burchellii* but with narrower and longer leaflets and the dorsal surface was glabrous. Later on we saw it growing abundantly in the open grassland.

We also found similar *Arachis* again in a mixed population, one with small standard petal with indistinct nerves on the back of the standard and short hypanthium while the other had large flowers with distinct nerves on the back of the standard and long hypanthium (VKRS 6609-6610). Near this location, in an area likely to get flooded periodically, we collected another population of *Arachis* (VKRS 6611) which looked quite similar to VKRS 6536.

We found both the types of *Arachis* growing together across the road with slightly drier grounds. At 5 km east of Carolina on the road to Balsas we found a mixed population - one with yellow flowers and the other with orange flowers. We collected seeds as well as plants (VKRS 6612) (Fig.5). We went back to Carolina, had lunch and crossed the river Tocantins on a ferry. At this place we waited to sift the soil collected earlier in the river to obtain seeds of VKRS 6609, 6610, 6611, and 6612. On the road from Filadelfia to Araguaina we spotted and collected *Arachis* (VKRS 6626) in a cerrado which was similar to the ones seen near Carolina. However, we observed plants which were almost glabrous to very hairy. We reached Araguaina by about 2130 hrs.

Sunday 14 - March (Collections: VKRS 6627-6631)

We left Araguaina in order to come as near as possible to Porto Nacional since the next phase of collection had to start there. We stopped at Colinas de Goias to collect the material left at Glocimar's uncles' place. We packed the vehicle and left Colinas after having lunch with Glocimar's uncle. On the way we stopped before Rio Feio, before Brasilandia, and collected *Arachis burchellii* (VKRS 6554) and reached Paraiso do Norte by 2000 hrs. We made herbarium specimens of *Paspalum* sp., *Axonopus* sp., and *Digitaria* sp..

Monday 15 - March (Collections: VKRS 6632-6637)

We spent much time to find a population of *Arachis* which was observed by other collectors a few km after the diversion to Porto Nacional. Glocimar was with the previous collection team, but had difficulty in locating the site as the vegetation had changed enormously after the rains. Finally he located *Arachis burchellii* (VKRS 6633) growing abundantly at about 8 km after the diversion to

Porto Nacional. Here again we observed some differences in hairiness. We collected about 50 seeds and made herbarium specimens. I noticed clear symptoms of C. *arachidicola*.

Next, as we were turning back to Paraiso for lunch, we found a few erect *Arachis* plants with tall main stem, large hairy leaflets, and long lateral branches (1.25 m). The pods were large and very hairy. We collected about 10 seeds, living plants and specimens for the herbarium (VKRS 6635).

After lunch we proceeded to Porto Nacional. At 24 km from Paraiso to Porto Nacional we found a population of *A. burchellii* (VKRS 6636), which looked similar to the one collected at Rosalandia (VKRS 6532) but with narrow leaflets and almost glabrous upper surface. We collected about 80 seeds from this population. At 32 km NW of the bridge of Rio Tocantins, we found *Arachis prostrata* (VKRS 6637) growing abundantly in a cerrado. We collected about 100 seeds and pressed herbarium specimens. Nodulation was fairly good. We reached Porto Nacional by about 2000 hrs.

Tuesday 16 March (Collections: 6638-6641)

A population of *Arachis prostrata* (VKRS 6638) was found on the banks of Rio Tocantins in Porto Nacional. This population was noted earlier by Glocimar on another trip. It again differed from typical *A. burchellii* in leaf hairiness (the upper surface was glabrous), leaflets were longer than wide, and the leaflets on the main axis were almost acute. We collected about 120 seeds and pressed herbarium specimens. In the Porto Nacional market we obtained one cultivated

groundnut (var. *fastigata*; VKRS 6639). Later on we drove straight to Natividade without finding any *Arachis*. After Natividade at about 3 km on the road to Dianapolis we found *Arachis burchellii* (VKRS 6604) growing abundantly. We once again noticed differences in hairiness, as well as leaflet size. As we could collect only five seeds we took plants in *Sphagnum*. We reached Dianapolis at about 2000 hrs without finding any *Arachis*.

Wednesday 17 - March (Collections: VKRS 6642-6653)

We left Dianapolis and headed towards Barreiras. The main objective today was to find *Arachis marginata*, which was originally collected by Gardner in 1839 and later by Gregory and Krapovickas (1959) in this area. The seed of this species was never collected and was lost in live collections. This species created confusion in the literature, as *Arachis burkartii* and *Arachis oteroi* were some times identified as *A. marginata*, since the leaf margins of these two species are also thickened. These two species come from the south, far away from the Dianapolis-Barreiras. Here we had a problem: three roads from Dianapolis to Barreiras. An old road, which is now in disuse (probably the one used by Krapovickas in 1959), a more recent one which goes through Taguatinga (which is much longer), and the most recent direct route. At Novo Jardim (40 km from Dianapolis), while waiting for lunch, we talked to the restaurant owner who informed us that a road 15 km back goes through a sandy area through several new rice farms leading to the old road. It also goes along the Rio Palmeiras, through which Gardner had probably travelled in 1839, so we decided to take that road. After about 18 km from the junction we found *A. marginata* (VKRS 6649) (Fig.4)

growing abundantly in almost pure sand. This plant has highly thickened leathery leaves, large flowers with very weak nerves on the back of the standard, and numerous tubers underground. The fruits were large with long horizontal pegs. After much digging we could get only two seeds (only one mature) so we took live plants in *sphagnum* and made plenty of herbarium specimens. We looked for its distribution and found it growing over most of the area and in rice fields nearby, probably cleared recently. I noted clear symptoms of C. *arachidicola* and some brown necrotic spots with dark margins.

On the way to main road we found A. *burchellii* (VKRS 6648) growing in sandy soil and also along a creek. We collected seeds and made herbarium specimens. Here I observed interveinal pustules on the leaflets. In some plants almost all the leaves showed these symptoms.

We went back to Jardim and later took the diversion to Barreiras. At 14 km after the diversion we found A. *marginata* (VKRS 6652), again growing abundantly in a sandy cerrado. This population would be about 50 km from the site of VKRS 6649 as the crow flies. However, we do not know whether it occurs in between these two sites. We obtained about 20 seeds, more was impossible as the night had fallen. We reached Barreiras at about 2200 hrs after a very satisfying day. We also took herbarium specimens of *Manihot* sp., *Aristida* sp., *Centrosema* sp., *Stylosanthes gracilis*, *Centrochloa singularis*, and *Paspalum* sp.(2).

Thursday 18 - March (Collection: 6654)

We left Barrieras after making a telephone call to CENARGEN to check travel arrangements and hotel reservation for the 21st in Brasilia. At about

3-4 km from Barreiras we searched unsuccessfully for A. *sylvestris* which was earlier collected there. The environs of this place had changed greatly in recent years. In the sandy patches along the road we stopped many times to look for A. *marginata* as well as for other species but in vain. We crossed the Rio Sao Francisco on a ferry and reached Ibotirama at about 1900 hrs.

Friday 19 - March (Collections: VKRS 6655-6656)

In the morning it rained heavily, it seems it always rains on St. Joseph day. So, we changed the herbarium sheets and dried them. Later when the weather cleared we went on the road to Paratinga, km 21.2 S of BR 242, to look at a population (Valls 6110) which was collected in June 1981. However, in June it was very dry so no flowers could be observed. This time we saw small flowers with clear markings on both sides of the standard petal, and the pegs and nodes had no roots indicating that this population (VKRS 6655) could belong to section *Ambinervosae*. However, this has been identified to be in section (Fig.2) *Triseminale*, but distinct from A. *pusilla* (pers. comm. Valls). It could be a new species! We collected more pods and returned to Ibotirama. In the afternoon Glocimar took the vehicle to a garage for a change of oil. We also collected *Paspalum* sp. for herbarium.

Saturday 20 - March (Collections: VKRS 6657-6661)

We left Ibotirama after reloading the vehicle. We crossed the Rio Sao Francisco, reached Barreiras and continued to Alvorada. As this road goes along the old Dianapolis road for some distance, we searched for A. *marginata* in the

sandy cerrados, but in vain. We reached Posse by 2100 hrs. We collected three samples of Lima beans (*Phaseolus lunatus*) and one sample of *Cajanus cajan*.

Sunday 21 - March (Collections: VKRS 6662-6668)

We left Posse early and travelled towards Brasilia. At a bridge just after Alvorada we found A. *prostrata* in full bloom (VKRS 6662) and we made herbarium specimens. Along the river Macaco we searched for A. *prostrata*, where Krapovickas and others had collected in 1959. Later, at 4 km N of Rio Extrema, where A. *prostrata* was collected by Valls in 1981 (Valls 6284) we found it in flowering. It was growing abundantly in a low cerrado. I noticed that some plants did not have markings on the back of standard petal. We made herbarium specimens (VKRS 6667). A. *sylvestris* was earlier collected at 1.5 km S of Vila J.K. (on BR 020) and we located it again. Looking at the flowers which were small and at lower nodes on the main axis, Krapovickas stated that earlier he had only observed larger flowers (generally at higher nodes) in A. *sylvestris* accessions. However, both in this sample (VKRS 6668) (Fig.7)as well as in an earlier accession (VKRS 6547), we noticed only small (< 3 mm) flowers on the lower nodes. It may be variation within the species, or A. *sylvestris* may have two kinds of flowers - larger at higher nodes on lateral branches and smaller at lower nodes on main axis. We also made herbarium specimens of *Paspalum* sp., *Centrosema* sp., *Panicum* sp., and *Eragrostis articulata*. We then drove straight to Brasilia. At CENARGEN we unloaded the herbarium specimens, living plants, seeds etc.

Monday 22 - March

Went to CENARGEN along with Krapovickas and Valls. Worked on the herbarium specimens to separate *Arachis* from the bulk and as well as to separate duplicates. Ms. Lucia, Secretary, informed that my tickets were confirmed and I would leave for Port of Spain on 24th.

Tuesday 23 - March

Krapovickas left for Corrientes in the morning. At CENARGEN we started to work on the notes on the material collected. I spent some time with Dr. Godoy on the plan of their cold storage, of which I have brought a copy.

Wednesday 24 - March

In the morning we completed notes and discussed the following points:

1. Duplicate herbarium specimens of *Arachis* collections held at CENARGEN for ICRISAT.
2. Lists of seeds of *Sorghum*, *Pennisetum*, *Arachis* and *Cajanus* etc. held at CENARGEN for ICRISAT.
3. Transfer of cuttings straight from CENARGEN, Brasilia to Reading University, U.K.
4. Supply of seed of *Rhynchosia* and *Eriosema* held in CENARGEN (ICRISAT does not have any *Eriosema* in its gene bank). These genera are related to *Cajanus*, pigeonpea.

Later I met Dr. Dalmo Giacometti, and thanked him who in turn expressed the hope that the cooperation between the two organizations would continue to flourish.

In the afternoon I showed Valls how to make cuttings from groundnut plants. I met Dr. Hahn from IITA who was interested in collection of *Manihot* germplasm. Valls drove me to the airport in the evening, I reached Rio de Janeiro by 2000 hrs and took the flight to Miami.

Thursday 25 - March

Reached Miami in the morning. I was compelled to stay with a guard till I entered the flight to Trinidad at 1400 hrs, despite declaring my honourable intensions to the immigration officials. I reached Port of Spain in the evening to be in the pleasant company of Dr. Haque and his family. It was nice change after a gruelling day.

Friday 26 - March

Went to the Caribbean Research and Development Institute (CARDI) located in the University of West Indies Campus along with Dr. Haque. This organization was established in 1975 to cater to the needs of twelve English speaking countries (CARICOM) in the region. Among many different programs which CARDI has, the Peanut Project is based in four territories: Antigua, St. Kitts, St. Vincent and Belize. Other areas included in the program are Jamaica, Guyana, St. Lucia, Montserrat and Barbados. Apart from Dr. Haque, who is a virologist and Project Leader, this project has full time agronomist and agricultural engineer. The CARDI peanut program has also assistance from an entomologist in Jamaica and soil chemist for 75% of the time. Part-time services of plant pathologist, entomologist, physiologist, and microbiologist are also available.

Table 2. Groundnut cultivation in CARDI countries

Country	Region	Altitude (m)	Rainfall (mm)	Area (ha)	Cultivar types
Jamaica	Santacruz	150	1250-1875	986	Valencia & Spanish
Guyana	(a) Intermediate savannas	30	2000	263	Altika, AK 62 Early runner
	(b) Rapunini Dst.	60	1500	-	
	(c) North-West Dst.	160	2500	-	
St. Vincent		0-46	1178-2540	80	Local runner
St. Kitts		0-310	1000-1500	80	Valencia types RF 10, Florigiant
Barbados		0-46	1143	40	Local runner, Florigiant, Florunner
St. Lucia	East Central Barbuda	0-62	1020	10	Virginia 72 R Shulamith, local sel.
Montserrat	Central Dst.	216	1524	5	Local runner

Table 2 indicates that groundnut is grown on a scale which is very small by Indian standards. However, the countries themselves are small. It also indicates that a significant number of farmers still continues to grow local cultivars of unknown origin. The size of the farms, except in Barbados and St. Kitts, is around 1 to 2 ha and most farmers use their own seed. Groundnut appears to have been widely distributed in the West Indies in Pre-Columbian times[1]. This may have given rise to different landraces. It may be therefore useful to collect whatever germplasm that is available in these islands as early as possible.

1. Purseglove, J.W. (1968) Tropical Crops, Dicotyledons-1, Longmans and Green, London.

The main objective of going to Port of Spain was to explore as well as to orient the staff of Dr. Haque towards collection. Fortunately the Agronomist Mr. Bates (who is stationed in St. Kitts) was also present. I explained in detail the planning and execution of collection mission. I went over the sampling theory and practical methods, information needed to be collected at the time of collection etc. Dr. Haque was confident that he would be able to organize the collection through CARDI staff located in each island/country. A set of all the collected material will be sent to ICRISAT gene bank for maintenance, evaluation and conservation. This I expect would benefit ICRISAT, both in terms of time and money needed for such collections and is also in line with IBPGR/ ICRISAT *ad hoc* committee's recommendations (1979).

I also met Dr. J.B. Bergasse, Executive Director, and Dr. Parasuran, Director (Research and Development). Both were hopeful that the forthcoming agreement with ICRISAT will help the efforts of CARDI to improve the food legume situation in the Caribbean.

I gathered information on pigeonpea production in this region. In the small island states the production is on a very small scale. Small farmers (1-3 ha) grow the crop as borders around their plots or in a system of inter-cropping with maize and root crops. Sowing usually takes place in June-July, the crop matures in December-January. The cultivars grown are mainly local selections and indeterminate perennial types. Improved cultivars now being used include 64-2B, Dwarf NATA and UWI Dwarf. Almost all the cultivars are sensitive to daylength.

Table 3. Pigeonpea cultivation in CARDI countries

Country	Region	Altitude (m)	Rainfall (mm)	Area (ha)	Cultivar types
Jamaica	-	225	1250-1875	2800	Local Khaki (kaki) (tall)
Grenada	Eastern Grenada Carriacon	-	1250-1500	607	Creole tall
Trinidad & Tobago	-	0-46	1524-2540	178	Local tall types UWI Dwarf
St. Vincent	-	36-183	1524-2032	56	UWI Dwarf
St. Lucia	-	0-62	020	52	Local tall types
Guyana	Coastal Region	-	-	16	Local tall and local dwarf
Antigua	-	0-30	1020	8	Local selection (August-November)
St. Kitts	Eastern Basseterre	125	1143	4	Local, UWI Dwarf
Barbados	-	0-33	1270-1524	3	Local tall

Table 3 gives details on pigeonpea cultivation in the West Indies. The area is small, consumption is mainly green peas, and has shown to be a good source of vegetable type. Dr. Laxman Singh, who is based in St. Kitts, looks after the pigeonpea work in CARDI.

Saturday 27 - March

Continued discussion with Dr. Haque. He informed me that groundnut is mainly used as snack in the Caribbean. Efforts are currently being made to improve the yield of this crop to increase the income of small farmers. Later in the morning we went to the National Horticultural Show. I left Port of Spain around 2000 hrs for Hyderabad via London and Bombay.

Fig. 1. New *Arachis* sp. (VKRS 6536) growing alongwith aquatic plants in water

Fig. 2. New *Arachis* sp. (VKRS belonging to section *Triseminale*

Fig. 3. Sympatric distribution of A. *burchellii* (VKRS 6574) and A. *sylvestris* (VKRS 6575)

Fig. 4. *Arachis marginata* (VKRS 6649) with tubers and pods

Fig. 5. *Arachis* sp. (VKRS 6612) population showing variability for flower size (and color).

Fig. 6. *Arachis* sp. (VKRS 6522) showing roots on pegs and nodules.

Fig. 7. Leaf spots on *Arachis sylvestris* (VKRS 6668)

Fig. 8. Interveinal pustules (?) on *Arachis* sp. (VKRS 6522)

Appendix

ARACHIS GERMPLASM COLLECTED IN BRAZIL

(March 1982)

S.No.	Coll.No.		Alt.(m)	Lat.(s)	Long.(w)	Date
1	VKRS-6466	: A. *lutescens* (Ex)*	680	15°.32'	49°.27'	2/3/1982

1) Locality : 24 km N of Jaragua (Goias).on BR-153 N of a bridge on river Saraiva.

2) Soil & Topography : Sandy mixed with gravel; vegetation dominated by *Rufa* sp., *Stylosanthes* sp.

3) Description : *Arachis* with short stem, long branches, hairy, small shiny leaves, plants found growing on the raised areas in the flooding zone along the edge of the river.

4) Pests & Diseases : Small, dark necrotic spots (hypersensitive reaction?) Insect damage.

5) Nodulation : Poor and small nodules.

2	VKRS-6475	: A. *prostrata* (Ex)	520	14°.17'	49°.09'	3/3/1982

1) Along BR-153 at km 273.2, 5 to 6 km N of Campinorte near 'Fazenda Buritazl'

2) Sandy bleached soil, with gravel and small rocks on top. Gradually sloping low 'Cerrado' with dense strata of shrubs. *Arachis* dominates the undergrowth; abundant in the cerrado, but disappears in the flooded area.

4) Brown spots with dark brown or black ring. Round to irregular nectotic portions.

3	VKRS-6485	: A. *prostrata* (Ex)	C. 400	13°.20'	49°.09!	3/3/1982

1) 50 m west of BR-153 at km 384. N of the bridge on corrego Funil.

2) Clay loam, compact, slightly undulating cerrado, modified for agriculture; *Arachis* dominated undergrowth in the open cerrado.

4) Small round to irregular black-brown spots (similar to pepper leaf spot) sometimes coalescing to form larger necrotic areas. Sporulation observed (*C. personatum*?). Light yellow mosaic similar to damage by mites.

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*Letters in the parenthesis indicate section
Ex = *Extranervosae*, TR = *Triseminale* AR = *Arachis*

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(W)	Date
4	VKRS-6496	A. *burchellii* (Ex)	280	11°.48'	49°.34'	4/3/1982

1) Low land right off the road from Formoso do Araguaia to Rio Javae. 2 km from Formose.

2) Dark sandy friable soil. Flat. Cerrado subject to flooding, with ground level dominated by grasses (*Paspalum* sp., *Panicum* sp.).

4) Necrotic spots similar to VKRS-6485. Woolly aphids.

5	VKRS-6517	A. sp. (Ex) (*prostrata*?)	C. 290	11°.55'	48°.44'	5/3/1982

1) 46 km SE of Gurupi. 12 km NW of river Santa Teresa on the road from Gurupi to Pexei near fazenda Taboca.

2) Compact sandy soil with gravel on top. Small area of cerrado near a creek. Mostly under the shade of tall trees.

6	VKRS-6522	A. sp. (Ex) (*prostrata*?)	C. 290	11°.55'	48°.44'	5/3/1982

1) 2.6 km SE of river Santa Teresa on the road from Gurupi to Pexie.

2) Flat sandy soil with gravel, hardpan beneath. Open cerrado with *Arachis* scattered all over.

3) Sometimes main stem growing tall (45 cm) in the shade of the grass.

4) Dark brown linear inter-veinal pustules. Raised pustules which fall off when rubbed.

7	VKRS-6530	A. *burchellii* (Ex)	320	11°.23'	48°.58'	6/3/1982

1) 42 km N of Gurupi along the secondary road from BR-153 near high tension wires.

2) Sandy soil with gravel on top. Low open cerrado with *Arachis* occuring frequently over a large area.

4) Dark brown spots and broad necrotic areas. Irregular lesions with yellow margin and terminal bud necrosis (TSWV?) woolly aphids.

...3.

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(w)	Date
8	VKRS-6532	A. *burchellii* (Ex)	280	10°.34'	48°.54'	6/3/1982

1) At the entrance of Rosalandia, West of BR-153. 200 m N of the bridge on Rio Mangnes.

2) Sandy soils with gravel, dense spots of *Arachis* in a highly disturbed cerrado.

3) Tall main stem.

4) Small black spots on leaves and some damage by leaf eating insect.

5) Poor nodulation.

9	VKRS-6536	A. sp. (AR) Series - Annuae	250			7/3/1982

1) At km 840 on BR-153, N of Miracema do Norte.

2) Clay soil with lot of organic debris. Marshy flooded area *Arachis* growing in and under water along with aquatic plants such as *Heliconia* sp. and species belonging to Maranthaceae family in open babacu palm (*Orbignya* sp.) forest.

3) Flowers orange yellow, small acute leaf-lets, rooting at basal nodes and hallow stems.

4) *Cercopora arachidicola* symptoms were noticed.

5) Poor nodulation.

10	VKRS-6540	A. *burchellii* (Ex)	250	09°.25'	48°.33	7/3/1982

1) 1 km N of Rio dos Bois at km 853.8 on BR-153, N of Miranorte

2) Shallow sandy soil with gravel. Undulating topography.

4) Symptoms of TSWV observed. Inter-veinal pustules.

11	VKRS-6546	A. *burchellii* (Ex)	-	-	-	7/3/1982

1) 25 km S of river Tabocao. 50 km S. of Guarai.

Herbarium specimen only.

...4.

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(w)	Date
12	VKRS-6547	A. *sylvestris* (Ex)	280	08°.51'	48°.31'	7/3/1982

1) 2km S of Guarai on BR-153, C. 200 m N of a small creek.

2) Clay loam with gravel on top. *Arachis* forming a dense patch in a restricted area near the fence of a grassland.

4) Tomato spotted wilt virus symptoms observed.

13	VKRS-6554	A. *burchellii* (Ex)	290	08°.22'	48°.30'	8/3/1982

1) Farm entrance east of BR-153, 150 m N of bridge on rio Feio.

2) Sandy loam (hard) with gravel. Cerrado with dense ground cover.

14	VKRS-6555	A. *burchellii* (Ex)	C. 200	07°.53'	48°.27'	8/3/1982

1) At 1015.4 km on BR-153, 18.2 km N of Colinas de Goias.

2) Small area of 'Cerradoa' (transition forest). *Arachis* frequent among tall grasses (*Panicum* sp., *Axonopus* sp., *Trasya purpurea*., *Trachypogon* sp.).

3) Flowers not seen.

15	VKRS-6556	A. *burchellii* (Ex)	210	07°.13'	48°.14'	9/3/1982

1) Along BR-153, 3 km S of Araguaina close to km 1097.

2) Red sandy loam, slightly undualting. *Arachis* along with *Paspalum maritimum* in a disturbed forest.

3) Main axis very tall (probably due to shade of tall grass) with few running lateral branches.

16	VKRS-6558	A. *burchellii* (Ex)	280	07°.07'	48°.11'	10/3/1982

1) Along BR-226 at km 1109.7, 300 m N of traffic patrol post.

2) Dark red sandy loam. Softly undulating topography. *Arachis* occurs in a disturbed cerrado dominated by *Paspalum maritimum*.

3) Plants in first flower.

...5.

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(w)	Date
17.	VKRS-6559	A. *burchellii* (Ex)	270	06°.57!	48°.05!	10/3/1982

1) 17 km SW of Vanderlandia on BR-226 near km 1136.

2) Yellow sandy soil, softly undulating topography. Cerrado with sparse ground cover.

3) Main axis 20 cm occurs in dense 'spots' which differ in their behaviour for flowering - one spot in full bloom while another spot with no flowers but with mature pods.

18	VKRS 6566	A. *burchellii* (Ex)	270	06°.55'	48°.02'	10/3/1982

1) At the entrance to a farm N of km 1141 on BR-226. 12 km SW of Vanderlandia.

2) Red sandy soil, softly undulating low forest. *Arachis* occurs as dense 'spots' competing with *Paspalum maritimum*.

3) Short isthmus between the articles of fruit. Main axis up to 40 cm. (shade effect?)

4) *Cercospora arachidicola* symptoms were observed.

19.	VKRS-6574	A. *burchellii* (Ex)	C 200	06°.40'	47°.44'	10/3/1982

1) 39 km NE of Vanderlandia on BR-226,30 km to Esterito.

2) Sandy loam, undulating cerrado.

3) A. *burchellii* sympatric with A. *sylvestris*.

20	VKRS-6575	A. *sylvestris* (Ex)	C 200	06°.40'	47°.44'	10/3/1982

1) Ref. 6574

2) - do -

3) - do -

4) Leaf webber damage was observed.

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(w)	Date
21	VKRS-6586	*A. burchellii* (Ex)	C 180	05°.08'	47°.29'	11/3/1982

1) 25 km N of Imperatriz in a farm 'Santa Maria', E of BR-010, near km 1376.

2) Red sandy loam, undulating forest cleared for pasture.

3) Good nodulation.

22	VKRS-6592		C 125	05°.32'	47°.28'	12/3/1982
23	VKRS-6598					
24	VKRS-6594	*A. hypogaea* subsp. *fastigiata* var. *fastigiata*				
25	VKRS-6595					
26	VKRS-6596	*A. hypogaea* subsp. *fastigiata* var. *vulgaris*				Tan seed color
27	VKRS-6597					Red seed color

(- Market samples in Imperatriz, town of Maranhao Province)

28	VKRS-6600	*A. burchellii* (Ex)	170	05°.39'	47°.23'	12/3/1982

1) 700 m S of bridge on rio Bananal, 13 km SE of Imperatriz, along BR 230.

2) Pure sand, disturbed and open cerrado. *Arachis* occurring abundantly. This seems to be same location where Lidio had collected specimens earlier (Coradin 3669).

29	VKRS-6602	*A. burchellii* (Ex)	170	05°.55'	47°.22'	12/3/1982

1) 40 km S of Imperatriz along BR-010 at km 1303.

2) Dark brown sandy soil with gravel. Undulating topography.

30	VKRS-6604	*A. burchellii* (Ex)	170			12/3/1982

1) 1 km ahead of VKRS-6602.

2) Plants growing in flooded area.

(Herbarium specimen only)

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(w)	Date
31	VKRS-6605	A. *burchellii* (Ex)	170	05°.58'	47°.22'	12/3/1982

1) Along BR-010 6 km N of Rio Arraias by the km 1295.

2) Sandy soil with lot of organic debris. Softly undulating topography. Cerrado cleared for agriculture.

3) *Arachis* occurs in dense 'spots'.

32	VKRS-6609	A. *sp.* (Ex)	170	07°.22'	47°.21'	13/3/1982

1) 12 km E of Carolina on the road to Balsas, along BR 230.

2) Heavy silted soil, subjected to flooding, undulating topography. Very open cerrado with dense ground cover.

3) Variable population for flower size, and number and darkness of lines on the back of the standard. An extreme form was collected as 6610.

33	VKRS-6610	-	-			13/3/1982

Rest of the details same as VKRS-6609.

34	VKRS-6611	A. *sp.* (AR) Series = Annuae	170	07°.22'	47°.21'	13/3/1982

1) 200 m ahead of VKRS-6609.

2) Marshy land subjected to flooding.

3) Plants with orange flowers, rooting at basal nodes on the lateral branches. Looks similar to VKRS-6536, 250 km away but in the same basin of Rio Tocantins.

35	VKRS-6612	A. *sp.* (*burchellii*?)	170	07°.21'	47°.24'	13/3/1982

1) At the conjunction of roads Carolina - Balsas - Goiantins on BR-230 5 km from Carolina.

2) Sandy soil, flat, open cerrado distrubed along the road.

3) Variable population, flowers generally orange-yellow, few plants with light yellow flowers (noted at 0900 hrs.).

...8.

S.No.	Coll.No.		Alt.(m)	Lat.(s)	Long.(w)	Date
36	VKRS-6626	A. sp. (*burchellii*?) (Ex)	C. 179	07°.25'	47°.37'	13/3/1982

1) 16 km SW of Filadelfia on the road to Araguaina.

2) Sandy, compacted, friable, softly undulating. Ill drained, open cerrado with dense herbacious cover.

3) Variable population for height of main axis, leaflet length and hairiness.

37	VKRS-6633	A. *burchellii* (Ex)	340	10°.13'	48°.48'	15/3/1982

1) 11-12 km from Paraiso do Norte on the road to Porto Nacional (8-9 km after the diversion to P. Nacional).

2) Light brown sandy soil with gravel, well drained, softly undulating cerrado with dense herbacious cover.

3) Variation for hairiness on the leaf surface.

4) Few plants with C. *arachidicola* symptoms were observed.

38 VKRS-6634 A. sp. (*burchellii*?) (Ex)

Details as VKRS-6633

3) Plants and leaflets were very hairy.

(Herbarium specimen only)

39	VKRS-6635	A. sp. (*burchellii*?) (Ex)	340	10°.13'	48°.48'	15/3/1982

1) 11 km from Paraiso do Norte on the road to Porto Nacional.

2) Sandy soil with gravel, plants growing on the soil accumulated by the side of the road.

3) Large plant with large, hairy leaflets, long lateral branches (1.3 m.). Large fruits (hairy) and strong pegs.

S.No.	Coll.No.		Alt.(m)	Lat.	Long.(w)	Date
40	VKRS-6636	*A. burchellii* (Ex)	C. 300	10°.17'	48°.42'	15/3/1982

1) 24 km from Paraiso do Norte in the road to Porto Nacional.

2) Sandy soil with gravel, well drained. Undulating topography. Low cerrádo with tufts of grass ground cover.

3) No flowers seen, similar to VKRS-6532.

41	VKRS-6637	*A. prostrata* (Ex)	C. 300	10°.27'	48°.35'	15/3/1982

1) 32 km NW of the bridge on river Tocantins on the road to Porto Nacional.

2) Flat sandy area, low cerrado with *Arachis* as dominating ground cover.

3) Leaflets rounded, resembled VKRS-6517.

5) Good nodulation .

42	VKRS-6638	*A. sp.* (*prostrata*) (Ex)	200	10°.42'	48°.24'	16/3/1982

1) Disturbed vegetation by the E. bank of rio Tocantins in Porto Nacional.

2) Sandy, friable and wet inclined bank subject to periodic flooding by river. *Arachis* forms dense 'spots', growing in shaded as well as open places.

3) Variation for leaflet size and shape.

43	VKRS-6639	*Var. fastigiata*	Red, Valencia

Market sample in Porto Nacional, Goias Province.

44	VKRS-6640	*A. burchellii* (Ex)	C. 400	11°.42'	47°.47'	16/3/1982

1) Close to Natividade, 3 km from the diversion to Porto Nacional on the road to Dionapolis.

2) White sand, very wet, badly drained. Cerrado with dense ground cover dominated by *Cyperus sp.*, *Arachis* being frequent.

Coll.No.		Alt.(m)	Lat.(s)	Long.(w)	Date
VKRS-6648	A. *prostrata* (Ex)	C. 400	11°.42'	46°.40'	17/3/1982

1) Fazenda "Agua Limpa", 6 km from the main road from Dianapolis to Jardim. 21 km from Dianapolis.

2) Sandy loam with silt from the river. Cerrado with *Arachis* dominant.

4) Interveinal pustules, in some plants on all the leaflets.

46 VKRS-6649	A. *marginata* (Ex)	C. 600	11°.37'	46°.36'	17/3/1982

1) Fazenda 'Agua Limpa' 6-8 km NE of the farm house on the bank of rio Palmeiras on the road to Fazenda do Acude and Duas Pontes. also in rice fields nearby.

2) Sandy soil, dry loose and friable, well drained. Open cerrado with tufted grass and other cerrado vegetation.

3) Yellow flowers, faintly extranervosed (at 1600 hrs.).

4) *Cercospora arachidicola* and brown necrotic spots with dark margins were observed.

47 VKRS-6652	A. *marginata* (Ex)	740	12°.02'	46°.21'	17/3/1982

1) 14 km after the diversion to Barrieras on the road from Jardim to Ponte Alta. (66 km from Dianopolis)

2) Loose sand at the foot hills, flat, open cerrado with scarce under growth. *Arachis* very frequent.

VKRS-6655	A. sp. (TR)	360	12°.21'	43°.13'	19/3/1982

1) 20.2 km from Ibotirama on the road to Paratinga on BR-242.

2) Sandy soil, friable with lot of organic matter subject to flooding. Meadow with *Copernicia* sp. (Waxypalm) dominated by *Axonopus purpurea*.

3) Same as Valls 6110. Small flowers, nerves on both sides of standard. Back of the standard purplish along the margin. Definitely not A. *dardanoii* (Parent 99 and 100 of WCG).

4) Pod rotting was very severe.

S.No.	Coll.No.	Name	Alt.(m)	Lat.(s)	Long.(w)	Date
49	VKRS-6662	A. *prostrata* (Ex)	520	14°.33'	46°.33'	21/3/1982

1) 12 km S of Alvarado on BR-020 (S of the bridge).

2) Gravely soil on the road side.

(Herbarium specimen only)

50	VKRS-6667	A. *prostrata* (Ex)	500	14°.56'	46°.59'	21/3/1982

1) Along BR-020 4km N of Rio Extrema.

2) Gravely, hard soil with sand below the surface. Open cerrado disturbed along the road.

Herbarium only. Same as Valls 6284.

51.	VKRS-6668	A. *sylvestris* (Ex)	530	15°.12'	47°.10'	21/3/1982

1) Along BR-020. W of the road 1.5 km S of Vila JK.

2) Sandy calcareous soil. Undulating topography. Area of secondary vegetation disturbed along the river.

3) Very small flowers on the main axis.

Herbarium only. Same as Valls 6601.