Report on travels to collect information and material for studies of the economic botany of *Vicia narbonensis*

Enneking, D. (1993)

Summary:

The following is a report about my travels in the Mediterranean during 1991 which had the aim to locate information about *Vicia narbonensis*, a species which holds considerable promise as a grain legume for Southern Australia and for other areas with mediterranean-type climates.

As there was little known about the cultivation and utility of this species within Australia, a journey to the areas where this plant originated and has been cultivated, seemed to be a logical extension of my bio-chemical studies, which were instigated to find the chemical basis for the unpalatability of the grain.

The lack of a profitable high-volume end-use market for the grain of *V. narbonensis* is the major current problem with this species. As the majority of our accessions for this species show clear traits of domestication, the question arose, for what purpose it had been domesticated in the "old world". To answer it, and to find out more about its distribution and genetic resources, this travel project was initiated and supported by my supervisor Dr. Max E. Tate and through financial help from the Hannaford Bequest Fund, kindly made available by the director of the Waite Agricultural Institute, Prof. Dr. Harold Woolhouse.

In my studies I have collected and collated information about *V. narbonensis* from the botanical and agricultural literature of the Mediterranean region and Europe, and the preliminary results are now in press (Enneking & Maxted, 1993).

A large part of the literature, especially anything dealing with taxonomy, was readily available in the collection (parts of it ex Charles Gunn U.S.D.A., Beltsville) of the now defunct *Vicieae* database at the Dep. of Biology (Drs. Nigel Maxted, Frank A. Bisby, Joe Smartt, J. Kearney) in Southampton. In addition the agricultural libraries at Rothamstedt, Berlin, Bonn, Hohenheim and Montpellier were visited to locate as much as possible of the literature on *Vicia* spp.

Visits to the laboratories of Prof. Dr. Arthur E. Bell, London and Dr. Fernand Lambein, Ghent helped our laboratory to establish personal contacts with three of the leading researchers in the field of non-protein amino acid chemistry (my visit to Ghent was timed to coincide with the visit of Prof. Dr. Gerald A. Rosenthal, one of the world authorities on canavanine).

In addition, my travels to the Eastern Mediterranean, have enabled me to make contact with Turkish colleagues in Ankara and Diyarbakir, and their Cypriot counterparts in Nicosia, as well as with leading researchers on grain and forage legumes at the International Center for Agricultural Research in Dry Areas(ICARDA), Aleppo, Syria.

A journey during the autumn of 1991 allowed me to visit resarchers in Spain and Portugal, the two countries being important sources of germplasm and know-how for *Vicia* & *Lathyrus.* A return to Montpellier made it possible to continue work in the important mediterranean herbarium at the Botanical Gardens, to record collecting information from herbarium sheets for *V. narbonensis*, and to discover that very little of this species was acutally collected in Southern France (the species being named after the city of Narbonne). Most herbarium specimen from the South of France belong to *V. johannis* according to recent classificiations..

In total, the costs for this project(A$ 3000 for expenses, $2000 for air travel, in addition to 6 months scholarship pay $7500) are within the range of any Ph.D. program and I hope that others are going to follow a similar approach in their postgraduate careers.

Details and highlights

24.4.91. I arrived at Heathrow, London, went by public transport to Southampton where I was received by Drs. Nigel Maxted and Frank Bisby.

The following 2 weeks were spent on photocopying from the extensive collections of documents (incl. the Gunn collection) of the *Vicieae* database project and the study of herbarium material. Fruitful discussions were held with drs. Bisby and Maxted, and I also met John Kearney, a Ph.D. student working on *Lathyrus.*

3.5.91 Visit to London. 1. Visited Prof. Arthur Bell, Dep. Biochemistry, Kings College, gave an impromptu seminar and discussed Non-protein amino acid toxins in *Vicia* & *Lathyrus* with him. A student of Bell worked on the isolation of γ–hydroxy-arginine from the seeds of*V. narbonensis*. The biologically active unknown compound in the acidic fraction of the free amino acids in the seeds of *V. narbonensis* had been arbitrarily neglected in favour of the unknown in the basic fraction e.g.γ–hydroxy-arginine. The next day over the phone, Prof. Bell expressed his interest in forming a collaboration on the chemistry of this unknown compound.

2. Visited Dr. Ann Butler, Dep. Human Environment, Inst. Archaeology, University College London and gave a seminar on the possible links of our work on *V. narbonensis* with archaeological problems. This was followed bystimulating discussions about grain legumes in Antiquity with her former supervisor, Dr. Gordon Hillmann. We found plenty of common ground and I was provided with several contacts and avenues for further investigation e.g. the story about *Lathyrus clymenum* on Santorini, and some details about current archaeological and ethnobotanical work on grain legumes and experimental reconstructions of historical farming systems.

9.5. Departed Southampton via London to Oostende. The Euro-Domino pass system turned out to be more economical for travel as it allowed 4 days travel in any country for which tickets were bought (prices varied according to the extent of available rail systems) within the tickets 1 month validity.

Departed Cologne for Paris

10.5. Arrive Paris , Gare du Nord and take train from Paris-Montpellier.
Friday afternoon was not the best time to arrive in Montpellier because of the incipient weekend, which made the establishment of contacts difficult(The Fax No. for Dr. Prosperi was not connected and he could not be contacted by phone)..
Dr. Allan Gibson's (CSIRO, Div. Plant Industry, Canberra) contact, Dr. Michel Obaton could be reached on the phone and he invited me to visit his laboratory. Dr. Philippe Naudin at (Ecole Nacionale Superieure Agriculturelle) ENSA was growing some of ICARDA's *V. narbonensi*s lines.
We collected *Rhizobia* from these crops and made arrangements for further proceedings.

11.5. Departed Montpellier for Spain in the evening to locate the extension agent Gregorio Fernandez Bailon who had sent commercial samples of *Vicia narbonensis* to Charles Gunn at U.S.D.A, Beltsville (this information was obtained from U.S.D.A., Beltsville, passport data)

12.5. Visit to Tarancon in Cuenca Province, the country side (famous through the adventures of Don Quixote), at the heart of spanish dryland farming. The local rainfall there is ca. <300 mm/annum, and the landscape seemed to be very marginal for cropping. It appeared from my view out of the train window, that in some places a type of run-off farming was practised reminiscent of Roman and Nabathean agriculture.
Unfortunately, at the local Department of Agriculture I was told, that Gregorio Fernandez Bailon had moved on to Guadalajara and the exact details remained obscure.

13.5. Madrid. Visit to the Australian Embassy to engage the help of an interpreter in order to locate Mr. Bailon over the phone. This turned out to be possible after some trying, and, as it was closing time at the embassy, the exact address for written correspondence was obtained through the wonderful help of the embassy interpreter .[A letter written in spanish after my return to Australia has not been answered to this date, and Mr. Bailon may have to be contacted through some spanish colleagues].

14.5. A train strike prevented any progress. The day was passed at Port-Bou.

15. 5 Return to Montpellier. Visit to the MPU Herbarium, (Curator) M.Sheffer. The herbarium at Montpellier holds an important collection of herbarium specimen for the Mediterranean area, and especially for North Africa. There I was able to view the collections for *Vicia narbonensis*, and prepared notes on the distribution of the species. 18.5 Hired a car for plant collecting trip at Frejus and found *V. johannis* at locations given for V. narbonensis in Fayence.Cannes Film festival for dinner.
The library at E.N.S.A. proved to be wothwhile a visit, but because spring was in full swing, and my priority to find *V. narbonensis* in the field, it was decided to follow up the literature during autumn.

17.5. Travel by train Montpellier-St.Raphael.
This location was chosen because the local flora seemed to have populations of V. narbonensis. A car was hired and the hinterland explored for the presence of *V. narbonensis*. It turned out that *V. johannis* grew in this part of the country, but no evidence for the other species could be found during a single day's search at documented locations.

21.5. After travelling by train through Italy, spending Easter in Liguria, arrive in Bari. Dr. Perrino not available. Instead I was able to meet Dr. Polignano and received a package of information about *V. narbonensis* in Italy, which had been prepared on instruction by Dr. Perrino. Arrangements were made to visit bari on my return from Syria to meet Perrino.
Departure for Greece .

22.5. Disembark at Korfu to take the bus, via Igumenitsa, across the mountains to the Aegaean sea for a swim at Platamonas. (The trains were on strike on arrival at the railway station in Meteora). Hitched a lift to Platamonas and found *V. bithynica* around the village.

25.-28.5. 6th European Nutrition Conference, Hilton Hotel, Athens. This conference was very interesting from a social point of view, and some interesting presentations were given on the production of the mycoprotein(*Fusarium graminearum*) product "Quorn", and I learned some important facts about fermented foods. Lactic acid fermentation is by far safer than any of the fungal fermentations, because of the low risk of toxic contaminants. Fermentation can increase the texture, flavour, aroma, colour, shelf life of a plant raw material. **Fermented plant products** were described as the **food of the future**. Our problems with the toxicity of *Vicia* & Lathyrus *would* be conveniently solved by cultivating microbial strains, which at the same time improve other quality parameters, thus producing nutritious and tasty food products for future generations. More Australian Research in this area is definitely warranted! One other advantage of fermenation methods is that they can be used in households without any great technological input, because of their simplicity. Thus, with the right type research backing, new markets could be developed for the relatively cheap grains of *Vicia* & *Lathyrus* spp..

With regard to the off-flavour in *V. narbonensis* seed I was assured by some experts from the Netherlands, that once the chemical identity of the off-flavour was established, microbial enzymes could be found to degrade it.

29.5. Departure for Turkey via Patmos.
On Patmos no *V. narbonensis* could be found, some faba beans were grown for donkey feed, other vetches(*Vicia* spp.) and chickling vetches(*Lathyrus* spp.) grown for hay, some lupins. The island is still farmed by the socalled" old style agriculture",

possibly for the benefit of tourism. It appears that the Greek islands are worth revisiting for the collection of Vicia & lathyrus germplasm, and it should be checked with the Greek genebank in Larissa, whether collections have already been made.

2.6. Stay in Seljuk(Ephesus). Visit of the roman ruins.

3.6. Arrival in Ankara. Dr. Donough Keatinge was extremely helpful in arranging contacts with Dr. Mehmet Munzur, at the Ankara Institute, and the very professional service at the joint CIMMYT/ICARDA office left a permanent impression. A visa for Syria was arranged through Dr. Keatinge and he also wrote an official invitation to visit ICARDA's headquartes in Aleppo, in case there were difficulties at the Syrian border.

6.6.Konya

7.6. Leave Konya via Selifke to Sanliurfa

8.6. Arrive Sanliurfa. Meeting with agricultural teachers from Sanliurfa University

10.6. Visit to Sanliurfa Agricultural University & Atatürk Dam. (Thanks to Erol Arslan's persistance & contacts). Foreign visitors are not normally allowed to see the dam without permission from Ankara, but the Erol Arslan, the sports teacher from Sanliurfa Agricultural University had a cousin who was in charge of the engineering section, so we went, accompanied by a military officer, and marvelled at this latest of human megastructures.
The Atatürk Dam is the 4th largest in the world(probably based on stored volume)
It has sufficient water for 900.00 ha of irrigation. Its height is 169m, its length 2000m and bottom width 1000m. The power output when in full operation is expected to reach 8.1 billion KW hrs/year (this information has not been checked with other sources). Departure for Diyarbakir

11. 6. Arrive Diyarbakir. The best reception ever was followed by a lunch with the director of the East Anatolian Research Institute, Dr. Dogan Sakir, his staff and repesentatives (U.S.) from the world bank. A seminar on our work with *Vicia* spp. was given to the Institute's staff. A field trip to the nearby town of Ergani, where a local agricultural extension officer helped us in searching for*V. narbonensis*, allowed me to get some impression of the local production of lentils on the rich basaltic soils which predominate around Diyarbakir. This area lies in the heart of the fertile crescent, which isthe cradle of seed agriculture. At 15 km from Ergani in direction to Dyarbakir we turned off to the right. *V. narbonensis* seemed to be quite common in lentil fields there (leaves with unequal leaflets, leaf apex with a tip like *V. sativa*, seeds brownish black (max. seed no.: 6). In Bereketli village, near Ergani, the local people occasionally, but not regularly, eat *V. narbonensis* as a pulse, which grows as a weed (herb) in lentil crops. The seed is boiled in salt water, together with other ingerdients I presume(no more dtetails). This type of ethnobtanical information is defintely worthwhile following up in some more detail, as it is of primary importance for the future of *V. narbonensis* as a relatively non-toxic grain legume for Australia

12.6. While in Ankara, Dr. Mehmet Munzur had presented me with a sample of the turkish *V. narbonensis* var. *aegyptiaca* elite line L 1541. The var. aegyptiaca is characterised by its large-seededness and is, according to my studies of the literature and of our seed collections, a domesticate. I considered it odd, when Dr. Munzur told me that this particular line had nbeen collected from the wild by Ömer Tarman (they call him the old man). Mr. Tarman has been working on vetches for the last 30 years in is one of Turkey's pioneers in this type of work. Because there was not much definite or detailed information about the cultivation of V. narbonensis to be gained from our agricultural colleagues in Turkey, it seemed to be a good idea to follow up this lead in Tunceli and to investigate whether cultivation of the crop was practiced, or had been practiced there.
So from Diyarbakir I took a trip to Tunceli, a town in the mountains near the sources of the Tigris. There was a strong military presence in the area and tight security on the roads, including searches for weapons on buses, armoured vehicles at strategic intersections etc.[Around about the same time a group of German tourists got kidnapped by kurdish rebels]
With the generous help of the local Department of Agriculture(Dir. Mevlut Aslan) it was possible to locate a sample fo *V. narbonensis* var. *aegyptiaca* which had been cultivated tgether with tick beans under supplemental irrigation more than a decade ago. The seed had originally come from the bazaar in Elazig.

13.6. Return to Diyarbakir. Excess baggage was posted to Germany.

14.6. Travel to Mardin and from there to the Syrian border at Nysaibin, which happened to be closed as it was Saturday 3p.m., plans were changed and back on the bus, along the border to Gaziantep. Stayed overnight at the bus station, because the small minibuses (Dolmus) only drive when they are full (Dolmus=full). In this particular case the bus filled up at dawn.

15.6. Arrive at the Syrian border by motorbike. Taxi to Aleppo (U.S. $ 50) and attendance at ICARDA's planning meeting for the Farming system and Pasture Forage and Livestock Program. Excellent accomodation with Dr. Scott Chritiansen. One weeks stay at ICARDA to meet Drs. Ali Abd El Moneim, Mohan Saxena , Valentine Aletor, Tony Goodchild, Rick Tutweiler, Jan Konopka, Bassam Malawi, Hazel Harris etc.
Seminar presented (Wed.) with the title" Does *Vicia narbonensis* have potential as a grain legume for dry areas?"
V. narbonensis is apparently cultivated south of Damascus, near Daraa & Sweida. The grain is being fed to cattle & sheep (no details).

21.6. Leave Syria by car to travel via Mersin, to Marmaris in order to take the boat to Rhodes and from there to Cyprus.

24.6. leave Marmaris for Rhodes. Afternoon trip to Lindos in the south of the island as there were some reported finds for *V. narbonensis* on this part of the island

25.6 The search for *V. narbonensis* in the fields (2 hrs) was unsuccessful, but plenty of other vetches grew there. Depart for Cyprus from Rhodes town.

26.6. Arrive Limasol, Cyprus and travel to Nicosia.

27.6. Contact Dr. Droushiotis at the Department of Agriculture meet Dr. Papastyliano (a friend of Don Marshall and ex W.A.R.I. graduate)
V. narbonensis has been giving very high yields (max. 5.3. t/ha) under favourable cypriot conditions. Small scale work with animals was planned.
Pioneering research on forage barley with shatter genes to ensure regeneration.

2.7. Travel to Paphos after exploring the hinterland and the Trodos mountains.

3.7. Flight to Athens

4.7. -5.7 Delphi

6.7 Patras

7.7. Brindisi-Bari. Meeting with Dr. Perrino, who is the director of the Italian genebank in Bari. He expressed his interest in collaboration with Australian researchers and mentioned that there were funds available from the EEC or the Italian Government to fund one side of an exchange program, provided that some bi-lateral research agreements were signed. Foggia, near Bari has been very active in research on *Vicia* spp. as forage crops, and the Puglia, the area around Bari is homoclimatic to some of our drier areas in the Southern Australian wheatbelt.
I was also able to meet Profs. A. Corleto and G. Pacucci of the Faculty of Agriculture, University of Bari, who have been working with *Vicia* spp.(incl. *V. narbonensis*), especially with *V. sativa*.

8.7. Bari-Rome

10.7 Visit to the FAO library in order to obtain some of the rarer documents on *Vicia*. Travel from Rome-Pisa

11.7. Visit Manuela Frediani, Botanical Gardens Pisa, who has is part of an Italian group working on cytogenetic and molecular aspects of *Vicia* spp.
Pisa-Florence.

After spending a few days in Florence, travel back to Germany
Florence-Munich by hitchhiking, Munich-Würzburg by train and Würzburg-Steinfeld (my hometown) by hitchhiking again.

Visit to the Tierärztliche Hochschule (TIHO) library, Hannover, to track down literature on *Vicia* poisoning.

27.7.-11.8 Family visits

23.8.-24.8. Visit to the Zentralinstitut für Genetik und Kulturpflanzenforschung D(O) 4325 Gatersleben,
where research on Vicia has been active for the last 20-30 years. Drs. Peter Hanelt, Jürgen Schultze-Motel, Helga Schäfer (now Maaß), have been involved in seminal research on *Vicia faba*, *V. narbonensis* and *V. sativa*. The Institute has an extensive collection of literature on cultivated plants and is together with Braunschweig one of the most important genebanks for cultivated plants in Germany. I was able to obtain the field observation data(flowering times, hundred seed weights etc.) for their V. narbonensis collection, passport data for *Vicia* sect. *narbonensis*. A two day visit does no justice to the literary, botanical and personal resources of this particular Institute and I am looking forward to my next visit.

18.8. Berlin. The time in Berlin was spent mainly in the libaries of the Stiftung pressischer kulturbesits , of the Ibero-American Institute and the Zentralbibliothek füt Landwirtschaft. There was not time to visit the botanical library at Berlin-Dahlem and thelibrary of the Humboldt University. I was told that the genetic transformation of *V. narbonensis* has been recently achieved by a team of researchers from Berlin and Gatersleben, but I was unable to make contact with the group contact, due to shortage of time.

31.8. Depart Berlin

1.9. Arrive Ghent to visit Dr. Fernand Lambein

2.9. Prof. Gerald Rosenthal, world authority on canavanine visits Ghent. Our canavanine story surprised him, especially the low doses at which unpalatabily manifest itself in pigs is news. Some developments were underway in the U.S. to develop anti-viral agents from canavanine, but our work points to some problems regarding the safety of canavanine following ingestion. Visit to Philippe Woitrin, Brussels who runs a large company, selling organic food products.

3.9. Visit to organic food company in Ghent. Travel London-Southampton

10.-11. 9. Rothamstedt library/Hire car

12.9. Kew library and meeting with Mr. Gillett. Mr. Gillett worked as Government Botanist in Iraq during the late 1940's and collected a specimen of V. narbonensis from Arbil, in Iraq Kurdistan, which according to his notes on the herbarium sheet (his memory cannot recall the details) was used as a pulse by the locals, while theplant served as a fodder for livestock.

13.9. Southampton-Cherbourg

14.9. Cherbourg-Paris St. Lazare

16.9. - 24.9 Montpellier, waiting for mail to catch up, work at the herbarium of MPU, meet M. Lahlou, a Moroccon vetch breeder studying for his masters degree at ENSAM. M. Obiste from the forage library was very helpful in finding references to *Vicia* spp.. I Talked with Phillipe Naudin: he was of the opinion that there was not much potential for *V. narbonensis* in Southern France, except for varieties with a small seed size for use as green manure

Barcelona-Madrid-Sevilla-Elvas-Evora
Arrive Evora, Portugal to visit Dr. Piedro de silveira and his son Piedro. Prof. Vasconcellos, the teacher of Silveira senior, wrote a paper on forage crops and mentioned V. narbonensis as a cultivated plant. With the junior Silveira, various leads were followed up in direction of Elvas, Beja and Lisbon in order to track down some definite information about the cultivation of *V. narbonensis*. This crop was cultivated in the region around Beja, under the name Faveta de Beja, and it was supposedly used to feed pigeons. The local agronomist and the previous agronomist (an old man) thought that a small seeded *V. faba* was the faveta de Beja, but samples of V. narbonensis obtained in Lisbon were clearly identified as Faveta de Beja. As this is in agreement with the literature and Vasconcellos account, the misleading information from modern Beja must be considered questionable. Cultivation Of *V. narbonensis* around Beja probably declined as a result of problems with the parasitic weed *Orobanche*, because for the same reason local cultivation of *V. faba* became economically unattractive due to high infestations. Not very much new information resulted from this short trip to Portugal, but some very interesting contacts were made and it is hoped that in the frame of further work on *Vicia* & *Lathyrus*, some more information about the cultivation and utilisation fo *V. narbonensis* is going to emerge

5.10. Leave from Evora via Agarve -Sevilla to Cordoba

7.10 Cordoba
Visit to Prof. José Cubero, who has been active with work on *V. faba* and intorduction to his wife Dr. Moreno. Dr. Amparo Martinez worked with *V. narbonensis* as part of a project to find resistance to *Orobanche*, and she was very helpful with seed samples. The major finding from this one day visit emerged from discussions with Prof. Cubero, who told me about the practice to cultivat *V. faba*/*V. narbonensis* mixtures as an insurance against adverse climatic conditions. The grain was used to feed ruminants. Again, here is a lead which would be worthwhile following up, in order to secure some more detail, especially in the light of recent findings (1980's) of the large-seeded var. *aegyptiaca* at several locations in Andalucia. *V. narbonensis* cultivation in Spain is likely to be of ancient origin and the introduction of this crop to Europe by the arab/berber civilisations remains a possibility. From here the trail looses itself to North Africa, and further information is likely to come from a more detailed look at spanish and berber agriculture.

8.10. Granada. Visit to the Alhambra

Madrid-Paris-Strasbourg-Stuttgart
Stuttgart Hohenheim, library
Stuttgart-Bonn
Bonn University library

29.10. SNCF Paris

Arrive Adelaide Grand prix Day

Adelaide 29.6.93

My sincerest gratitude is expressed to all of those who have helped me before, during and after my journey and who allowed me to make this project a reality

Dirk Enneking