

LU·BI·LO·SA 3

The Newsletter of Phase 3 of the LUBILOSA Programme

LUBILOSA - Lutte Biologique contre les Locustes et Sauteriaux
The Biological Control of Locusts & Grasshoppers

Issue No. 3 October 1997

WELCOME

The time seems to fly between one edition of LUBILOSA 3 and the next. So much happens in each intervening period it is difficult to know which things to include and which to exclude. Reporting on the Partners Meeting held at Bamako in May is one event that could not be excluded. Organized by Jurgen Langewald and Mdm Ba-Diallo, the meeting was a great success bringing together representatives from eight National Programmes in West Africa. The two intensive days included a mixture of formal presentations and lively discussion. An abridged version of the Final Communique is included in this issue.

One of the subjects that was reported at the Partners Meeting and which generated a great deal of interest, was the work of Ralf Peveling and his ecotoxicology team. I do not want to reduce the impact of the story, so I will leave you to read the article on the next page but it will suffice to say that the results represent a ringing endorsement of the environmental credentials of the LUBILOSA mycoinsecticide relative to their chemical counterparts.

This edition of LUBILOSA 3 also takes a look at a wider issue on a piece of published work that has implications for the utilization of mycoinsecticides for locust and grasshopper control across Africa. Please take time to read the article on *Metarhizium* taxonomy and if you have any strong views on this issue then please contact me, I will be pleased to address these in later editions of the newsletter.

Chris Lomer (LUBILOSA Programme Leader) and Hugo de Groote (LUBILOSA socio-economist) discuss the development of farmer participatory work within the LUBILOSA Programme and the progress that has been made in this important area. Raising awareness and interest among farmers is crucial for ensuring acceptance of the mycoinsecticide as a grasshopper control agent.

The Personal Profile section profiles Andy Cherry and Jeremy Harris; Jeremy joins LUBILOSA as the Project Officer and I am pleased to be able to take this opportunity to welcome him to the team.

And finally, for those assiduous readers of LUBILOSA 3 who noticed the incorrect quotation of Vidal Sasoon in the last issue - my apologies to you and Mr Sasoon, the quote should have read "The only place where success comes before work is in the dictionary". In this issue, we have a few more quotes and a poem which I trust I have correctly cited.

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NO IMPACT ON REPTILES

Reptiles make up a large proportion of the vertebrate fauna in semi-arid and arid environments and are frequently exposed to pesticides sprayed against locusts and grasshoppers. Densities of sand-runners (*Acanthodactylus dumerili* and *A. boskianus*) may reach 1,000 individuals/ha in Western Mauritania and observations carried out by LUBILOSA scientists have confirmed that organophosphate insecticides have an adverse effect on populations. Despite their important role in the desert environment both in terms of biodiversity and biomass, few studies have been conducted to evaluate the impact of insecticides on this very important taxa. As part of LUBILOSA's commitment to developing an environmentally friendly mycoinsecticide, it was felt necessary to evaluate the impact of *Metarhizium flavoviride* strain IMI 330189 on lizards through use of appropriate toxicological studies. However, no such tests have been conducted with lizards before so it has been necessary for LUBILOSA scientist, Ralf Peveling (Institute of Environmental Sciences, University of Basel, Switzerland) to develop a completely new test. A simple limit test was set up to determine the oral and inhalation toxicity of two chemical standards and *M. flavoviride*. Full data analyses are not yet completed but the following are available. All lizards treated orally with one of the chemicals died within 5 hrs of treatment; the other caused 50% mortality over the 4 week period and activity and feeding was significantly reduced in the survivors. By contrast no lizards died in the oral or inhalation tests with *M. flavoviride* - lizard behaviour, food-uptake, total food consumption and changes in body weight were unaffected by the treatments and in addition there was no indication of fungal growth in the lungs of the lizards. These tests represent a landmark in toxicological testing and also demonstrate the safety of *M. flavoviride* IMI 330189 for this important indicator species.

AN ODE TO ROY BATEMAN

A poem for your amusement. Interestingly, it was written prior to the 1940's and 50's boom in insecticides development.

"An ode to Roy Bateman"

Spray, farmers, spray with care,
Spray the apple, peach and pear;
Spray for scab and spray for blight,
Spray, O spray and do it right...

Spray your grapes, spray them well,
Make first class what you've to sell,
The very best is none too good,
You can have it, if you would.

Spray your roses, for the slug,
Spray the fat potato bug;
Spray your cantaloupes, spray them thin,
You must fight if you would win.

Spray for blight, and spray for rot,
Take good care of what you've got;
Spray farmers, spray with care,
Spray, O spray the buglets there.

-Packard, 1906

TAXONOMY CLARIFIED

Isolates of *Metarhizium* collected during the earlier phases of LUBILOSA were placed initially in *M. flavoviride* (Prior, 1992) but experience of variation in morphology of the conidia in a wider range of isolates raised some doubt about this placement. Recent work by Richard Milner at CSIRO, Australia (Milner *et al.*, 1994) has indicated the inadequacy of using morphological characteristics for separation of *M. "flavoviride"* isolates from acridoids, including those studied by LUBILOSA.

In a paper that has just been published (Bridge *et al.*, 1997), Paul Bridge and his colleagues describe biochemical and molecular studies on the relationships of 30 strains of *Metarhizium* including *M. anisopliae* from acridid and non acridid hosts and some of the *M. "flavoviride"* isolates from acridoids currently under study by LUBILOSA. The relationships were investigated by isoenzyme analysis, PCR-RAPDs and protease production.

The results of these biochemical and molecular studies indicate that the isolates of *M. "flavoviride"* from acridoid hosts are distinguishable both from *M. anisopliae*, whether from acridoids or other hosts, and from *M. flavoviride* var. *flavoviride* and *M. flavoviride* var. *minus*. It is apparent from these results and previously published work (Bridge *et al.*, 1993; Bidochka *et al.*, 1994; Cobb and Clarkson 1993) that there are 3 groups within *M. flavoviride*. These are Group 1, consisting of the original isolates of *M. flavoviride* var. *flavoviride* described from coleopteran hosts and soil in Northern Europe; Group 2, consisting of the isolates of *M. flavoviride* var. *minus* from S.E. Asian homopteran hosts which are similar to Group 1 but distinguishable by host, geographical range, conidial size and molecular methods, and Group 3 isolates from acridoids in Africa (including Madagascar), Australia and Galapagos which have morphological features of both *M. anisopliae* and *M. flavoviride* but are distinct on both biochemical and molecular criteria. Interestingly, an acridoid isolate recently received by LUBILOSA from Brazil appears morphologically to fall into this group, although biochemical and molecular data are not yet available.

The paper concludes that there are two types of *Metarhizium* isolates that may be obtained from acridid hosts in the field. The first is a diverse group of isolates broadly characterisable as *M. anisopliae*, which vary in their virulence, e.g. IMI 168777 from *Schistocerca gregaria* in Ethiopia. The second are genetically uniform, highly virulent isolates which are distinctive by biochemical and molecular criteria, have a pan tropical distribution and have only ever been recorded from acridoids e.g. IMI 330189, the main LUBILOSA isolate.

The implications of these findings are that, even though the LUBILOSA isolate IMI 330189 was isolated from *Ornithacris cavroisi* in Niger, it is a pan-tropical isolate with characteristics identical to other isolates found as far afield as Australia and the Galapagos and possibly even Brazil. In Africa, where the Sahel ecological zone extends unbroken across northern Africa and encompasses parts of Senegal, Mauritania, Mali, Burkino Faso, Niger, Chad, Sudan and Ethiopia, and hence where locusts and grasshoppers are distributed throughout, there is no reason to believe that the Group 3 isolates are not distributed throughout.

LUBILOSA has a mycoinsecticide for locust and grasshopper control based on a pan-tropical isolate: a mycoinsecticide for Africa!

LUBILOSA PARTICIPATORY TRIALS

In developing a new technology, there is always a balance between research scientists developing the technology to the point where they are sure it works and involving farmers early enough to influence development of the technology to suit their needs.

During the first phase of the development of a mycopesticide for grasshopper and locust control by LUBILOSA, formulations and field monitoring techniques were under development. Farmers were informed of the objective of the research and stayed to watch the application but were not generally interested in the detailed counting and monitoring which followed. In Phase 2, formulations were much improved but still the main research trials were being carried out on fallow land with only peripheral farmer involvement. The primary objective of these trials was to obtain scientifically valid evidence of the mycopesticide efficacy against a range of target species. Although socio-economics input was requested, scientific evidence of efficacy was the first priority for funding. Fortunately, collaboration between IITA and CNEARC resulted in a Nigerian student, Idrissa Maiga, on study leave from the Niger Plant Protection Service, working with LUBILOSA during the 1995 field season in Niger, Mali and Benin. The sites where rural development NGOs were active were previously selected by LUBILOSA socio-economics consultant, John Stonehouse.

A training course in participatory rural appraisal was carried out for LUBILOSA staff and other participants by DFPV trainers in a village near Niamey in July 1995. The first step in participatory work is to assess and prioritise problems with farmers. Normally, this should be done in a diagnostic phase prior to the initiation of a research project but LUBILOSA set out from the premises that (a) locusts and grasshoppers are a major problem, confirmed by the surveys and (b) that an environmentally benign locust control agent was needed. Seen in the wake of the huge quantities of chemicals used, often to rather doubtful effect, during the 1986-89 Desert locust plagues, these were justifiable assumptions. The first of these participatory appraisals confirmed the interest of the farmers in the acridid problem. Although some concerns were raised about pesticides and fish, other concerns about the toxicity of current chemical pesticides were confined to the village brigades who actually apply pesticides (often without protective gear).

The second step was to inform farmers of the availability and characteristics of the new technology. This was done by simply repeating the 'standard' LUBILOSA format trial with farmers applying the biopesticide under LUBILOSA supervision and visiting field cages as often as they liked. Farmers were also involved in counting grasshoppers but they were not interested in the numbers per se and less than 70% reduction in population was not convincing to them. On the other hand, the occurrence of dead grasshoppers both in the cages and in the treated plots was of interest to them, in particular the red coloration and the appearance of green spores exactly as they had been shown in advance. Some farmers also noticed a feeding reduction, inferred by a reduction in the amount of faeces produced in the 'treated' cages. These observations led to some controlled scientific experiments by LUBILOSA which confirmed a feeding reduction in grasshoppers following infection. Under farmer-field conditions, contamination of control plots occurs as farmers freely visit both plots. This makes scientific interpretation of the results difficult but shows the efficacy and virulence of the pathogen.

In 1996 our NGO partners were interested in repeating trials to a similar format. These NGOs are often characterised by a

NEWS IN BRIEF

National Partners meet in Bamako to discuss successful field trials in Benin, Gambia, Ghana, Mali, Niger, Senegal, Sudan and South Africa.

Toxicological studies indicate no impact of LUBILOSA *Metarhizium* isolate on lizards.

In a recent scientific paper the taxonomy of *Metarhizium* was clarified. The implications of this work are that it has demonstrated that the LUBILOSA isolate is pan-tropical.

Dr Paul Wellings, Chief Entomologist, CSIRO, Australia has taken up the position of Chairman of the LUBILOSA Expert Advisory Committee.

strong participatory approach; most of the government plant protection services in Africa are changing slowly from top-down to more participatory approaches. Nevertheless, the staff themselves are keen to learn and work with LUBILOSA at the pilot sites. Sahelian farmers still tend to see the treatment of migratory pests as a government responsibility and encouraging them to take control of these issues is not straightforward.

The third step in participatory trials, once farmers have shown an interest and know how *Metarhizium* works, is to leave the technology with them and see how they experiment and adjust it. That is what is happening this year, when trials in Mali and Burkina Faso will compare farmer use with standard LUBILOSA application. For instance, given the current price of the product, there was interest in reducing the dose of spores applied. A small, cheap sprayer (the 'Pompi') is also being tested.

The third step also involves making explicit comparisons with alternatives. Other technologies which we hope to compare within the IPM context are the destruction of egg pods and the collection and sale of grasshoppers for food. A survey of traditional control techniques by John Stonehouse found that grasshoppers were amongst the most difficult of the millet pests to control by traditional techniques and the biggest problem with egg pod destruction was finding the oviposition sites.

LUBILOSA was recently joined by a Swiss associate expert, Dieter Müller, who is enlarging our participatory approach in the south of Benin and determining farmers' interest in participating in village brigades to control *Zonocerus*.

So far, LUBILOSA participatory trials are focused in three or four pilot sites. With good uptake in these sites, a much larger publicity and awareness campaign will be necessary to ensure the acceptance of mycopesticides as grasshopper control agents.

Chris Lomer and Hugo de Groot

Acronyms:

CNEARC (Centre National d' Etudes Agronomique des Régions Chaudes, Montpellier, France)

DFPV (Département de Formation en Protection des Végétaux, Niamey)

IITA (International Institute of Tropical Agriculture)

LUBILOSA (LUtte Biologique contre les LOcustes es SAuteriaux)

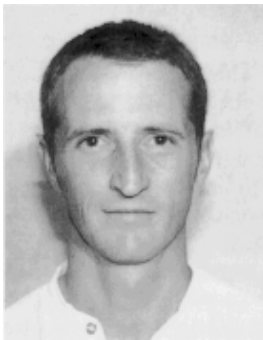
NGO (Non-governmental organisation)

LUBILOSA PROFILES



Jeremy Harris graduated three years ago from Nottingham University with a Bsc in Zoology and previously worked at the Ministry of Agriculture, Fisheries and Food and then at the Intervention Board as a payments manager where he gained experience in dealing with both commercial companies and government departments. Jeremy will be responsible for publicity and marketing of the LUBILOSA

Programme while providing administrative support to the team and maintaining a level of continuity in the absence of David at the IIBC, UK office.



Andy Cherry joined the LUBILOSA mass production team at IITA in January 1997. Andy has taken over supervision of the production unit after the departure of Nina Jenkins, who has returned to UK to continue with LUBILOSA at IIBC in Ascot. He is responsible for ensuring the continued production and supply of high quality spores for the African national programme trials and for LUBILOSA itself, including the planned

1000 hectare trial in Niger during August.

Andy is on a contract with IIBC from NRI in England where he normally works as an insect pathologist specialising in mass production, application and storage of viral insecticides for control of lepidoptera. He did his MSc in India at the old CIBC station in Bangalore working on mango gall midge parasitoids. Andy is also a PhD graduate of Silwood Park where he worked on IPM of *Plutella xylostella*. He spent a year of his PhD at Zamorano in Honduras where he undertook a parasitoid release programme against *P. xylostella*. Andy is accompanied by his wife, Caroline and three young daughters.

"Even if you are on the right track, you'll get run over if you just sit there." - Will Rogers

POSITIVE REACTION

The LUBILOSA Gender Policy Statement has generated a great deal of interest to the extent that we are having to consider a second print run. The francophone version is now also available. If you would like a free copy of either the english or francophone versions, please contact Jeremy Harris, LUBILOSA Project Officer at the IIBC address.

PARTNERS IN BAMAKO

LUBILOSA scientists met with National Partners in the hotel Mande, Bamako, Mali, 7 to 9 May to discuss:

- efficacy trials carried out by Partners in Benin, Gambia, Ghana, Mali, Niger, Senegal, Sudan and South Africa
- results of studies on the toxicity and ecotoxicity of the mycoinsecticide
- socio-economics studies
- issues concerned with production
- advances in formulation
- the perspectives for implementation of the research in progress

Trials conducted by the project or with the farmers proved successful with good levels of field efficacy. Mortality was usually apparent seven days post-treatment. Early application of the biopesticide on the first hatchings and the persistence of the product was considered appropriate for the efficient use of the mycoinsecticide in preventive control.

The results of both vertebrate and invertebrate toxicological and ecotoxicological studies continue to be very encouraging. In comparison with certain chemical pesticides, very little impact on either parasitic wasps or reptiles was observed. The extent of the mycoinsecticides impact on parasitic wasps, although undesirable at any level, do not represent cause for concern. Tests on other non-target organisms are being continued.

A study of farmers' perceptions of the biopesticide has been carried out. Farmers, concerned about the impact of chemical pesticide treatments on human and animal health, were keen to obtain the LUBILOSA mycoinsecticide, provided the price was acceptable. The delay of 7 days between treatment and effect was considered a disadvantage by farmers accustomed to the immediate effects of chemical treatments. Training and information is necessary to address these concerns.

Contacts have already been made with commercial companies for mass production of the mycoinsecticide. At present, the price based on local production of the product is beyond the means of small farmers. Methods of providing price support were discussed.

Although LUBILOSA is a research programme, the seminar participants examined the possibilities for implementation of present results, in order to avoid a sudden decline in activities at the end of the funding.

"He who builds a better mousetrap these day runs into material shortages, patent-infringement suits, work stoppages, collusive bidding, discount discrimination and taxes." - H E Martz