SIP# 268 Round 2

Title: Whole genome characterization of crops using microarray technology

Acronym: ARRAY MARKER

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Fork to farm: Food, health and well being

Type of project: R&D project, including technology demonstration (large scale)

Summary: The principle of this technology is to characterize the whole genome of a crop / plant without the prerequisite of sequence information. Characterization could entail the generation of genetic linkage maps or fingerprinting the diversity within a species. This technology is currently being applied to tomatoes in a European Union supported sixth framework project called EU-SOL. The project particularly focuses on mapping, isolating and characterizing genes underlying important traits such as healthiness, nutritional value, taste, flavor, fragrance, shelf-life, starch composition, yield and plant architecture. New alleles of key-genes for these traits will be extracted from the rich biodiversity present in the Solanaceae. This natural biodiversity is an under-exploited sustainable resource that can enrich the genetic basis of cultivated plants. Assembly of these genes within new genotypes will boost our knowledge of the factors that control quality. Also, it will provide a blueprint for novel high quality varieties to be developed by tomato breeding companies using breeding strategies based on marker-assisted breeding and genetic manipulation using exclusively natural plant genes.

Expertise offered: Genotyping using Microarray technology that uses the whole genome, is low-cost, high-throughput, robust system with no prerequisite for sequence information nor is it dependent on gel electrophoresis.

Previous FP involvement: Yes

Details of previous FP involvement: EU-SOL is an integrated Project supported by the European Commission through the 6th framework programme

Consortium status: No future consortium exists

Expertise sought: Partners who need Genetic linkage map generation using microarray technologies

Related projects: FP6

SIP# 275 Round 2

Title: Development, production and marketing of maize and bean cultivar seed for use in sustainable rural livelihood systems

Acronym: SRLS

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: 1.Develop, and/or acquire public maize and bean cultivars for evaluation in small community farmers systems. Selection emphasis will be on and food and health security traits important to the small farmer. 2. Testing and selection of developed cultivars for adaptation to community farming systems. 3. Develop a seed production and seed conditioning facilities. 4. Marketing and distribution of the seed to small community farmers to establish a commercial sustainable rural livelihood system.

Expertise offered: 1. The ARC has the necessary plant breeders and research infrastructure to develop suitable maize and bean cultivars. The challenge is to get the cultivars off the shelves and into the farming communities. In order to do this the ARC will need seed production and marketing assistance

Previous FP involvement: None

Consortium status: The ARC-Grain Crops Institute maize and bean breeding research programs manned by experienced plant breeders and with the necessary research farm infrastructure. Breeder seed and pre-basic seed production is done by the breeders.

Expertise sought: Partners needed: A commercial grain farmer for certified seed production and seed conditioning on farm. A marketing arm is needed to distribute the seed into small farmer communities.

Related projects: South African national R&D programmes

SIP# 277 Round 2

Title: Molecular breeding of cereal crops

Acronym: CEREALSYSTEMS

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project (small scale)

Summary: Molecular breeding of cereal crops using innovative approaches for validation of gene function, such as over-expression and gene knockout approaches. Bioinformatics approaches will be used to exploit synteny in cereals to link phenotypes to gene function, thus selecting alleles of value for crop improvement. This knowledge-based approach will provide improvements to cereal crops of importance to Europe (such as barley and wheat) as well as to cereals of relevance in Africa, such as pearl millet.

Expertise offered: ACGT Microarray Facility (www.microarray.up.ac.za)Microarray expertise (Lab and Data Analysis) Biology of cereal crops - pearl millet particularly. cDNA library construction and recombinant DNA technology Excellent plant growth facilities ACGT Bioinformatics and computational Biology unit (www.bi.up.ac.za)

Previous FP involvement: Yes

Details of previous FP involvement: FP5 - Co-ordinator of INCO-DEV project, FP6- Partner in Integrated Project - EU-SOL

Consortium status: Consortium not formed yet

Expertise sought: Partners interested in establishing Integrative genomics approach to improvement of cereal crops, Partners with expertise in gene knockout technology applied to cereal crops

Related projects: None

SIP# 278 Round 2

Title: Systems biology of plant defence against root pathogens

Acronym: ROOTSYSTEMS

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Crop defence against root pathogens is poorly understood on account of most fundamental work being carried out on leaf pathogens. The bacterial wilt pathogen, Ralstonia solanacearum, normally a pathogen of tropical crops, has invaded Europe in recent times on account of global warming, and poses a threat, particularly to the potato industry. Resistant varieties of Arabidopsis plants have been identified and a systems biology approach, exploiting the genomics tools of Arabidopsis, will be taken to identify generalised determinants of resistance to root pathogens that can be deployed in crop plants.

Expertise offered: ACGT Microarray Facility (www.microarray.up.ac.za) Microarray Expertise (Lab and Data Analysis) ACGT Bioinformatics and Computational Biology Unit (www.bi.up.ac.za) Plant-Bacterial wilt pathosystem in Arabidopsis. Recombinant DNA technology.

Previous FP involvement: Yes

Details of previous FP involvement: FP-5 - Coordinator of INCO-DEV project (SAFEMAIZE); FP6 - Partner in Integrated Project (EU-SOL)

Consortium status: Consortium not formed yet

Expertise sought: Partners interested in establishing Integrative genomics approach to understanding Root biology, Partners with interest in root pathogens of crops

Related projects: None

SIP# 281 Round 2

Title: LTN Bio-Science awareness

Acronym: LTNB.Sc

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Life sciences & biotechnology for sustainable non-food products & processes

Type of project: Implementation support to FP7s

Summary: We believe there is a great need to provide commercialisation support to guide companies to the point where their technology is suitable for international licensing. We would therefore actively encourage companies and research institutions to be well equipped and make use of FP7s initiatives by providing market and industry research and assessment studies, partner matching with established EU companies, IP audits to assess whether company's IP is licensable, licensing and negotiation assistance and training, industry research and identification of potential license partners for their technology. Awareness of the FP7 program will be done by means of seminars and workshops for the specific industry, in various parts of the country, articles and notices in industry publications, radio and other media interviews, and co-operation with industry associations, export associations and chambers of commerce. A major reason why companies don't get involved with initiatives such as FP7 is because of a perceived fear of the administrative burden it would place upon them. To overcome this, we would contract interns to provide FP7 application, monitoring and reporting support to SMEs throughout the whole process. Companies are also often unaware of the various government support structures and subsidies that would assist them to become active in the international market. Awareness of these resources, as well as application support would be provided along with the creation of awareness of the FP7 initiative.

Expertise offered: Market assessment and research commercialisation support IP audits and assessments Negotiation training Licensing support Match making Industry research Mentoring and coaching Event organizing Media liaisoning

Previous FP involvement: None

Consortium status: An established company focusing on supporting companies to develop their intellectual property to the point where it can be commercialised or licensed to international companies. The expertise of the current partners is listed in 4 above.

Expertise sought: No additional skills are required

Related projects: None

SIP# 287 Round 2

Title: Using Plant secondary compounds to improve Quality of Life of humans

Acronym: plantsecqol

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Life sciences & biotechnology for sustainable non-food products & processes

Type of project: R&D project (small scale)

Summary: The Phytomedicine Programme [http://www.up.ac.za/academic/veterinary/depts_paracl_phyto.htm] investigates the biological activity of extracts and compounds present in plants growing in South Africa for the benefit of its people and animals using a multidisciplinary and collaborative approach. We develop new herbal extracts for use in humans, animals and animal production, but also isolate and characterize bioactive compounds. We focus on microbial and parasitic infections, but other areas of applying plants products are also investigated when opportunities arise. We liaise closely with industry and a small company has been established to commercialize our results. We currently have17 PhD and 15 MSc registered students working on a diverse range of topics. The programme consequently applies academically sound methods and tries to understand the background to the problem, rather than developing a quick fix. Therefore we not only isolate compounds and test biological activity, but also follow up on aspects such as toxicology, pharmacology, testing activity in animals, mechanism of activity, industrial application and enabling rural use. We keep regulatory requirements in mind to ensure that products developed may be registered for use in animals or humans. Several patents have been registered and products developed. We have had some success in developing • techniques that are now widely used in the scientific community, • quality control of medicinal plants and trading standards [see www.aamps.org], • a procedure to produce high activity grape seed extracts, • a safe herbal tooth decay product with higher activity than chlorhexidine, • a herbal product that outperformed Zn-Bacitracin in poultry challenged with Cryptococcus neoformans in an effort to replace antibiotic feed additives used in animal production, • a herbal product with higher activity against plant fungal pathogens than 6/7 commercially used fungicides • a topically applied plant extract based product with higher activity than gentamicin against Staphylococcus aureus.

Expertise offered: We have screened leaves of close to 400 tree species against the following organisms: Staphylococcus aureus, Methycillin resistant Staphylococcus aureus, Enterococcus faecalis, Escherichia coli, Pseudomonas aeruginosa, Mycobacterium smegmatis, Candida albicans and Cryptococcus neoformans. This is an ongoing project and we have identified many species with excellent activities. Good candidates are selected for students to do further work on. We have developed procedures to potentise activities of plant extracts leading to patentable products based on substantial evidence for synergistic effects. We are situated in a Faculty of Veterinary Science within the section Pharmacology and Toxicology and have excellent facilities for animal experiments. We have developed techniques for evaluating antibacterial and antifungal activities as well as wound healing activities in a rat model. We have developed techniques to evaluate efficacy of plant extracts and isolated compounds against nematodes, coccidia and ticks. We have isolated and characterized many biologically active plant compounds.

Previous FP involvement: None

Consortium status: Loose cooperation in Germany, Finland, and Botswana not structured

Expertise sought: Partners that can collaborate on using plant extracts to improve the productivity of animals, e.g. by replacing antibiotic feed additives. Also using plant extracts/compounds to combat plant and animal fungal pathogens.

Related projects: FP5
FP6
International bilateral cooperation
South African national R&D programmes

SIP# 299 Round 2

Title: Credible Risk Assessment Governance of Foods derived by means of Genetic Modification and of New Crop Pesticides in South Africa

Acronym: RAgovern

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Fork to farm: Food, health and well being

Type of project: Networking between organistations in same area

Summary: The aim of the study is to contribute to the development of a credible and improved system for the governance of risk assessment of new crop pesticides as well as the safety and risk assessment of foods obtained by genetic modification before release for consumption. The intended study aims to evaluate several existing South African regulatory frame works for pre-regulatory risk assessments according to a number of criteria pertinent to credibility as developed by international bodies as well as specific countries. The Codex Alimentarius Commission played an important role. Two criteria that are pertinent to the concept of credibility have been the basic points for a recent study in Europe under the Safe Foods programme of the European Union as well as the restructuring of food control in Australia and New Zealand into one body, FSANZ. These criteria are: o The functional separation of risk assessment and risk management are important in order to maintain scientific integrity o The need for transparency in decision making and procedures having as end result the labeling of foods. The following matters would be included as criteria of credibility: o Systems for conducting risk assessment; o Role and function of policy making bodies at various levels of risk assessment; o Methods of advising e.g. peer reviewing and consultants; o The role of government officials. o Level of expertise; o Quality of data o Principles and guidelines for risk assessments The research would include an investigation into the governance of safety of foods derived from genetically modified organisms, as well as crop pesticides, from the perspective of pre-regulatory risk assessments by drawing from criteria identified to contribute to credibility. The methods to be used are questionnaires and interviews with international as well a national authorities.

Expertise offered: The candidate has 18 years experience in government in risk assessment of new chemical and biological pesticides and 9 years of risk assessment of foods derived through genetic modification. A supervisor and co-supervisor have been identified and the protocol will be submitted soon for approval to the relevant authorities at the University of Pretoria

Previous FP involvement: None

Consortium status: none

Expertise sought: Groups involved in policy research specifically with respect to risk assessment in the field of food safety e.g. Dialogik in Germany and the University of Sussex on the precautionary principle

Related projects: None

SIP# 302 Round 2

Title: Omics for Breeding of Improved Fruit Tree crops

Acronym: FTOmics

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: The application of genomics, proteomics and metabolomics for the development of improved breeding systems for the major fruit crops (apple, pear, prunus etc).

Expertise offered: Genetic mapping, genome sequencing, expression studies with transcriptomics and proteomics, bioinformatics.

Previous FP involvement: Yes

Details of previous FP involvement: Negotiating with ISAFRUIT for collaborator status for remainder of FP6

Consortium status: Current FP7 consortium in this area being proposed by Dr Eric van de Weg of PRI, Wageningen

Expertise sought: Partners will involve expertise in genomics, proteomics, metabolomics, plant pathology, physiology and biochemistry, horticulture, with a focus on the major fruit crops.

Related projects: FP6
South African national R&D programmes

SIP# 315 Round 2

Title: Radiation-induced mutagenesis for generation and screening of abiotic stress tolerance in soybean

Acronym: SOYMUTAGENESIS

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Life sciences & biotechnology for sustainable non-food products & processes

Type of project: R&D project, including technology demonstration (large scale)

Summary: Glycine max (soybean) is the major source of world supply of edible vegetable oil, and the dominant source of high-protein feed for livestock and is a source of high quality protein for humans. Soybean oil is widely used in the production of biodiesel, which reduces pollution caused by use of conventional fossil-derived diesel. Legumes such as soybean form symbiotic relationship with soil bacteria which fix atmospheric nitrogen, thereby providing a source of nitrogen for the legume and the soil; and can thus be used in crop rotation for environmentally friendly enrichment of the soil, avoiding the use of synthetic fertilizers that have deleterious effects on the environment. Soybean has substantial economic importance in a wide range of industrial, food, pharmaceutical, and agricultural products. It is thus clear that legumes contribute to the integrity of the earth's environment, are a resource of food for many forms of life and provide raw materials for medicine and many industrial applications. Furthermore, there is a strong worldwide desire to ensure sustainable availability of food resources for an ever increasing world population. However, legumes and other plants are dramatically negatively affected by abiotic stresses such as salinity and drought. It is therefore important to minimize loss of plant yield associated with these abiotic stresses by developing stress tolerant plants and the identification of genes contributing to abiotic stress tolerance has the potential to help in developing stress-tolerant plant varieties through biotechnology. The project aims to induce random mutations, through irradiating heavy ions into soybean tissue using accelerator cyclotron technology (Radioactive Isotope Beam). Irradiated plants will then be screened for changes in their tolerance to drought and salinity (abiotic stress). Single Nucleotide Polymorphisms (SNPs) analysis, Amplified Fragment Length Polymorhisms (AFLPs) and Targeting Induced Local Lesions In Genomes (TILLING) will be used on DNA isolated from abiotic stress-tolerant mutants and wild type soybean plants towards identifying the mutated gene(s). In addition to generating abiotic stress-tolerant soybean lines, this research will identify genes involved in the regulation of plant responses to abiotic stress and iad in the characterization of signal transduction networks (through transcriptomic and proteomic analysis of mutant versus wildtype soybean plants) that can be manipulated by genetic engineering towards enhancing soybean tolerance to abiotic stress.

Expertise offered: South African collaborators (Stellenbosch University, University of the Western Cape and the Centre for Proteomic and Genomic Research at the University of Cape town) will offer expertise in general plant molecular biology (including molecular analysis of wild type and mutant soybean plants via SNP and AFLP-based technology and TILLING), analysis of plant physiological tolerance to abiotic stress, transcriptomics (microarrays) and proteomics. Japanese collaborators (RIKEN's Nishina Center for Accelerator Based Science) will provide expertise and facilities for irradiation of soybean plant tissue.

Previous FP involvement: Yes

Details of previous FP involvement: EU GRAIN LEGUMES FP6 TTC Extension

Consortium status: In process

Expertise sought: Stellenbosch University will offer expertise in general plant molecular biology (molecular analysis of mutant and wild type soybean plants) and analysis of plant physiological tolerance to abiotic stress. University of the Western Cape will offer expertise in proteomics while the Centre for Proteomic and Genomic Research at the University of Cape Town) will offer expertise in transcriptomics (microarrays) and proteomics. RIKEN's Nishina Center for Accelerator Based Science will provide expertise and facilities for irradiation of soybean plant tissue.

Related projects: None

SIP# 328 Round 2

Title: Holistic Parasite Management

Acronym: HPM

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Testing of new methods of parasite management in livestock, with the emphasis on alternatives to pharmaceutical products, concentrating on plant candidates (like tannins), diatomaceous earth and other natural products

Expertise offered: Developers of world -acclaimed Famacha system of targeted selective treatment for haemonchosis. Links to ethno-veterinary expertise in South Africa. Worked with FAO, EU and Wellcome on related grants, working with SARE (USA) as well.

Previous FP involvement: None

Details of previous FP involvement: FP6 - PARASOL

Consortium status: PARASOL - Active

Expertise sought: Partners with experience or interest in developing new investigating and methods of parasite control for integration into a holistic programme

Related projects: FP6
International bilateral cooperation

SIP# 329 Round 2

Title: Exploring smoke technology for sustainable land use

Acronym: Smoke

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: Thematic network on specific research questions

Summary: Smoke released from burning vegetation contains a chemical signal that triggers germination of both fire-prone and non-fire species from different parts of the world. It is used in horticulture to stimulate seed germination of wildflower species and can break dormancy and improve germination of some vegetable crops. Smoke can be applied to seeds immediately before sowing, or the seeds may be pre-treated and stored until conditions are appropriate for sowing. Both aerosol smoke and smoke solutions are active in this respect. The identification of the active compound provides greater impetus to determine the mechanism/s of action. Smoke treatment is effective on many seeds that have light requirement for germination. A very clear concentration effect, resembling that of hormonal responses has been established with aqueous smoke solutions. Smoke extracts interact with gibberellins, cytokinins, abscisic acid and ethylene in photoblastic and in thermo dormant seeds. However, despite these interactions it remains questionable whether smoke acts via hormones in stimulating seed germination. The aims of the project are to characterize and synthesize the active compound, analyse the toxicological effects of the compound and its derivatives. Further aims are to investigate the physiological effect and mode, through which the active compound affects seed dormancy and germination, using tools such as differential display and microarray and characterize botanical and agricultural aspects of use this naturally available germination cue both in recultivation of native plant species and in cultivation of plant species important in horticulture and agriculture. The compound may have a potential in weed control and in the sustainable land use.

Expertise offered: We have been involved in research on smoke-stimulated seed germination since the early 1990s, when it was first discovered, by a South African scientist, that smoke provided an important chemical cue for triggering germination of a fynbos species. Since then, it has been found that smoke stimulates the germination of seeds of many species, including some commercial crops. Importantly, we have isolated and identified the main chemical responsible for this action of smoke on seeds. It is of great interest to discover the mode of action of this compound. Additionally, the use of smoke and the smoke-derived compound in particular, in agriculture and horticulture holds great promise. There is a great potential for this to be used for conservation, land rehabilitation and in the agricultural sector.

Previous FP involvement: None

Consortium status: We already have an indication of interest to collaborate in this project from Prof. E. Balazs (Hungary), Dr L. Kohout (Czech Rep.), Dr E. Zazimalova (Czech Rep.), Prof. V. Ordog (Hungary)

Expertise sought: None, we have already found suitable partners

Related projects: International bilateral cooperation

SIP# 332 Round 2

Title: Identification, validation and characterisation cowpea genes conferring drought tolerance and its application in breeding/engineering of drought tolerance in crops preferred by resource poor farmers.

Acronym: HydroGene

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Biotechnology companies world-wide are developing new tools for the agro-food industry, and assists in the protection of crops against adverse environmental conditions. It is, thus, of great importance that South Africa, a large crop consumer, should pay much more attention to the development of agrobiotechnology. It is estimated that about 14.3 million South Africans are vulnerable to food insecurity and agricultural biotechnology can make substantial contributions towards increasing food production by rural resource poor farmers. The use of biotechnology with a clear poverty focus must be identified and offered in farmer-preferred cultivars without imposing additional costs or changes in agricultural practices. In order to understand the gene networks that underlie plant stress, it is necessary to identify, and characterise the genes that respond to abiotic stress. A project is presented in which the genes conferring drought tolerance in cowpea and cassava, for use in vegetable crops of importance to resource poor farmers in Southern Africa, will be identified, validated and characterised. This will be accomplished by use of suppression subtractive hybridisation (SSH) and DNA microarray analysis. Once the drought tolerance genes have been identified and isolated the genes will be incorporated into vegetable crops used by resource poor farmers which would lead to substantial increases in yields in areas where water availability is a problem. Increased crop yields will improve food production, contributing to improved food and household security for many people depending daily on the vegetable crops. The proposed project will, therefore, use microarray technology to verify and characterize the gene/s leading to drought tolerance in cowpea. Thus, the proposal motivates for the utilization of biotechnological methods to fast-track the development of vegetable varieties adapted to Southern African conditions. Molecular markers for use in marker assisted selection/breeding will also be identified.

Expertise offered: The cowpea line TVu 7778 is susceptible to drought, while another line IT96D/602 is extremely tolerant to drought. Both lines were subjected to a drought stress at the ARC-VOPI. A cDNA drought expression library containing the genes that are involved in drought tolerance has been constructed by means of SSH (reverse and forward subtractions performed). Microarray slides are being spotted in preparation for the identification of drought tolerance genes using microarray technology. The ARC is a parastatal and one of the science councils in the South African National System of Innovation. The ARC-VOPI's Biotechnology Division has a "critical mass" of researchers with experience in Molecular Biology, Biochemistry as well as advanced plant tissue culture. The research team works in a well-equipped Molecular Biology laboratory. The Division is supported by an in vitro genebank/commercial tissue culture facility, greenhouses (including a quarantine facility for transgenic plants) and a hardening-off facility.

Previous FP involvement: Yes

Details of previous FP involvement: Genetic improvement of maize to enhance food safety by introducing resistance to Fusarium moniliforme (SAFEMAIZE)

Consortium status: Dr Ivan Ingelbrecht, International Institute of Tropical Agriculture (IITA), Biotechnology Laboratory, PMB 5320, Oyo Road, Ibadan, Nigeria. Tel: +234-(0)-241 2626 ext 2729; Fax: +234-(0)-241 2221; E-Mail: i.ingelbrecht@cgiar.org

Expertise sought: Need experts in genomic-based research. Genomic research is generating a lot of data so we need expertise as to how to use the available data for mining of useful genes. Assist us to remain up to date with the latest genomics research being performed in the international community. Assistance in the adaptation of the research being performed at the ARC-VOPI in order to be in line with international trends.

Related projects: None

SIP# 333 Round 2

Title: Identification and isolation of the potato (Solanum tuberosum) gene that confers resistance to common scab (Streptomyces scabies) and its application in disease resistance

Acronym: ScabShield

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: The project has just been initiated at ARC-VOPI. The aim is to isolate unique genes to overcome constraints to crop production in Southern Africa and to develop technologies to enable the transfer of these genes into farmer preferred varieties adapted to local conditions. This will lead to increased crop productivity thereby contributing to poverty alleviation and food security in South Africa and the African continent. Common scab, caused by Streptomyces scabies, is a major problem in potato. The major cultivar produced in South Africa is BP1. However, it is very susceptible to common scab. Bags containing infected seed tubers are rejected or de-certified. The disease reduces the cosmetic value of table potatoes and results in the downgrading of consignments in the table potato market. Literature searches on Silverplatter Medline, revealed that no research with regard to scab resistance using biotechnology is being performed. Therefore, the genes that play a role in resistance against common scab will be isolated from a resistant potato cultivar. For the identification of differentially expressed genes suppression subtractive hybridisation (SSH) and DNA microarray analysis will be used. The proposed research project is based on the expectation that the incorporation of the common scab resistance gene into susceptible potato cultivars could substantially increase market yields. This technology can be applied to all the potato cultivars that are susceptible to common scab and will have worldwide applications. Biotechnology presents a faster way of obtaining a common scab resistant BP1 line (approximately 10 years) than conventional breeding which can take up to 15 years to produce a cultivar that is resistant to the disease. The process will not only lead to the identification of the genes playing a role in common scab resistance, but also to the identification of several other disease resistance genes.

Expertise offered: The ARC is a parastatal and one of the science councils in the South African National System of Innovation. The ARC-VOPI's Biotechnology Division has a "critical mass" of researchers with experience in Molecular Biology, Biochemistry as well as advanced plant tissue culture. The research team works in a well-equipped Molecular Biology laboratory. The Division is supported by an in vitro genebank/commercial tissue culture facility, greenhouses (including a quarantine facility for transgenic plants) and a hardening-off facility. Potato breeders are also available at ARC-VOPI and both the susceptible and more potato scab tolerant potato cultivars are available at ARC-VOPI.

Previous FP involvement: Yes

Details of previous FP involvement: Genetic improvement of maize to enhance food safety by introducing resistance to Fusarium moniliforme (SAFEMAIZE)

Consortium status: Only ARC-VOPI, still looking for other interested parties.

Expertise sought: Need experts in genomic-based research. Genomic research is generating a lot of data so we need expertise as to how to use the available data. Assist us to remain up to date with the latest genomics research being performed in the international community. Assistance in the adaptation of the research being performed at the ARC-VOPI in order to be in line with international trends.

Related projects: None

SIP# 334 Round 2

Title: In this study: How does the introduction of the apple pgip1 (Mdpgip1) gene into the potato genome affect gene expression.

Acronym: Bio-SafePotato

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Commercialisation of GM crops will become increasingly important. The South African Government has instigated a regulatory process to address concerns of consumers in order to pave the way for commercialization of transgenic crops. Risk assessment process pays particular attention to potential adverse effects on human and animal health and the environment. The potential occurrence of ‘‘unintended effects’’ is one of the concerns being raised regarding the application of recombinant DNA techniques. Development of molecular techniques such as profiling techniques has made it possible to address these concerns. The aim is to establish genomics technology within the ARC. This is important, since the gene discovery programs that have been and that are to be implemented within the ARC will lead to the production of GM crops/products. All of these have to be assessed using these established technologies. Genomics is the study of genes and their function in humans, animals, plants or other living organisms. The technology can be applied in order to study the effect of the newly introduced gene(s) on the gene expression profile occurring in response to the introduction of “foreign” gene(s) into the genome. In this study we want to investigate how the introduced apple pgip1 (Mdpgip1) gene into the potato genome will affect gene expression.

Expertise offered: The untransformed as well as the apple pgip 1 (Mdpgip1)BP1 potato cultivar is available at ARC-VOPI. These will be used in this study. The potato breeders are available on station at ARC-VOPI. The ARC is a parastatal and one of the science councils in the South African National System of Innovation. The ARC-VOPI’s Biotechnology Division has a “critical mass” of researchers with experience in Molecular Biology, Biochemistry as well as advanced plant tissue culture. The research team works in a well-equipped Molecular Biology laboratory. The Division is supported by an in vitro genebank/commercial tissue culture facility, greenhouses (including a quarantine facility for transgenic plants) and a hardening-off facility.

Previous FP involvement: Yes

Details of previous FP involvement: Genetic improvement of maize to enhance food safety by introducing resistance to Fusarium moniliforme (SAFEMAIZE)

Consortium status: None, this project has just been initiated at ARC-VOPI.

Expertise sought: Need experts in genomic-based research. Genomic research is generating a lot of data so we need expertise as to how to use the available data. Assist us to remain up to date with the latest genomics research being performed in the international community. Assistance in the adaptation of the research being performed at the ARC-VOPI in order to be in line with international trends.

Related projects: None

SIP# 269 Round 2

Title: Reduction of N excretion in ruminants

Acronym: NexRum

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Sustainable production & management of biological resources

Type of project: R&D project, including technology demonstration (large scale)

Summary: Efficient nitrogen utilisation and reduction of nitrogen excretion in ruminants is important both for higher efficiency of production and reduced environmental impact. This project will improve the knowledge of ruminant digestion and metabolism and potentially lead to the development of genetic markers for breeding of animals with efficient nitrogen metabolism. The aim is to compare the digestion and metabolism of hardy and N efficient African cattle with high yielding European varieties from a number of perspectives.

Expertise offered: During the 20th century the African Nguni breed of cattle entered the growing commercial sector and extensive recording facilitated breed improvement. This breed is now a source of excellent genetic material well suited to survive under adverse conditions due in part to an efficient nitrogen recycling pathway resulting in animals substantially less dependent on dietary protein than other breeds. A South African consortium is already embarking on a project to study the unique metabolism of this breed from the perspective of the physiology, enzymology, proteomic profiling and genetic analysis. Expertise includes enzymology (particularly nitrogen metabolising enzymes), rumen microbiology and biochemistry, proteomics, and genetic markers for livestock.

Previous FP involvement: Yes

Details of previous FP involvement: SAFEFOODS and others

Consortium status: A South African team involving the ARC, CSIR and University of Pretoria already exists but needs to link up with European partners and consortium leaders

Expertise sought: Need European partners with expertise in ruminant physiology, biochemistry and metabolism, who are interested in undertaking a corresponding physiological, enzymological, proteomic and genetic analysis of European animals

Related projects: South African national R&D programmes

SIP# 270 Round 2

Title: Post market monitoring of GM food impact

Acronym: GM-PMM

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Fork to farm: Food, health and well being

Type of project: R&D project (small scale)

Summary: GM food has been consumed for some years in South Africa, and increasingly now in Europe. Food safety is assessed prior to the granting of approval for release or placing on the market, using the safety assessment procedures of the Codex alimentarius. Increasingly, GM foods with altered levels of key nutrients are likely to become available, providing improved nutrition for both the developed and developing world. However, methods for the determination of post-approval population-level impacts (either positive or negative) are not well developed. Post-market impacts could include changes in crops grown and consumed; increase or decrease in levels of key nutrients consumed, and associated changes in health status of the population.

Expertise offered: The South African population already consumes a variety of GM foods including staples such as maize. As a developing country, with nutritional constraints, it offers an excellent model for studies on the impact of the introduction of GMOs. Moreover, our scientists are involved in the development of GM crops with enhanced nutritional characteristics, we have techniques in place for analysis of GMOs, and we have nutritionists with relevant expertise. We also have access to consumer groups and small scale farmers who are growing GM crops for their own consumption.

Previous FP involvement: Yes

Details of previous FP involvement: SAFEFOODS

Consortium status: We have been informed that the coordinators of the SAFEFOODS project (Wageningen) are considering forming a consortium

Expertise sought: The SAFEFOODS partners already have most of the expertise required

Related projects: FP6

SIP# 272 Round 2

Title: Development of genetic tools for molecular breeding including improvement of tolerance to drought/water stress

Acronym: Gentoolsbreed

Submitted by:
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Theme: Food, agriculture and biotechnology

Focus Area: Fork to farm: Food, health and well being

Type of project: R&D project (small scale)

Summary: Development of genetic tools to assist with molecular breeding of crops for crop improvement including tolerance to drought and to water stress. This project will use state of the art technologies applicable to molecular marker development and most appropriate for the crop being studied. This project will make use of the current knowledge of genetic basis and systems involved in tolerance to stress, be it to environment or to disease. The crop or crops to be studied in this project/s will be of interest to Europe as well as South Africa.

Expertise offered: Extensive experience in molecular marker techniques and have generated markers that were used in marker assisted selection. Expertise in microarray technology, cDNA AFLPs, SNPs and microsatellites. Some experience in statistical analysis.

Previous FP involvement: Yes

Details of previous FP involvement: SAFEFOODS, PHARMAPLANTA

Consortium status: University of the Witwatersrand could be included and European partners are still not identified although some have been approached.

Expertise sought: Partners interested in crop improvement with skills in techniques involved in crop breeding improvement by using molecular markers for molecular

Related projects: None

SIP# 274 Round 2

Title: FIBRE GENOMICS: Increased fibre and energy from fast-growing tree crops

Acronym: FIBRE GENOMICS

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Theme: Food, agriculture and biotechnology

Focus Area: Life sciences & biotechnology for sustainable non-food products & processes

Type of project: R&D project, including technology demonstration (large scale)

Summary: Fast-growing plantation tree crops such as Populus and Eucalyptus species are very important renewable resources for biomass, fibre and energy. Within the next 12 months, complete genome sequences will be available for both of these fibre crop species. This offers a unique opportunity to harvest these two genomes for genes and processes that will lead to increased fibre and energy production. This can be achieved through a multi-disciplinary approach based on comparative genomics, systems biology, candidate gene identification and detailed functional testing in model plants and trees.

Expertise offered: The Forest Molecular Genetics Programme at the University of Pretoria offers expertise in tree genomics, genome mapping, functional genetics analysis of fibre genes in Arabidopsis and allelic discovery in fast-growing Eucalyptus tree species. We have established a research focus on cellulose biosynthesis in Eucalyptus trees. We also have access to valuable improved plant materials through a local consortium with the two major players in the South African pulp and paper industry. Both of these companies (Sappi and Mondi) have significant presence in Europe.

Previous FP involvement: None

Consortium status: Proposed and seeking to join or merge with European initiatives

Expertise sought: We would be happy to join and contribute to a European consortium that includes expertise in wood biochemistry, wood development, functional testing of genes in poplar, bioinformatics and molecular genetics of forest trees

Related projects: South African national R&D programmes