



Workshop to determine the demands of Biotechnologies in the MERCOSUR

BIOTECH – ALA – 2005-017-350 – 1b

REGIONAL SEMINAR REPORT OILSEEDS CHAIN

Biotechnology Development Support Program in
MERCOSUR

European Union Cooperation – MERCOSUR

BIOTECH

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ABBREVIATIONS

UGP: Management Unit of the Supporting Program for Biotechnologies in the MERCOSUR – BIOTECH

BIOTECH: Supporting Program for Biotechnologies in the MERCOSUR – BIOTECH

CADB: Commission for the Support of Biotechnology Development

SNP: Single-Nucleotide Polymorphism

QTL: Quantitative Trait Loci

1. PLACE, DATE AND DURATION

COUNTRY: Paraguay

DATE: April 10, 2008

PLACE WHERE THE WORKSHOP TOOK PLACE: IICA Office, Asunción

PRODUCTIVE CHAIN: Oilseeds (with emphasis on soybean)

2. PARTICIPANTS

Participants: Annex 1

Represented Institutions: Annex 1

Coordinators: M.Sc. Edgar Alvarez. Agricultural Research Office Vice Director de la Dirección de Investigación Agrícola(DIA/MAG). Coordinator of the Biotechnology Research Program of DIA/MAG.

Moderator: Lic. Gonzalo Fuentes Coiana

3. WORKING PROGRAM

Annex 2.

4. OUTLINE OF DEVELOPED SUBJECTS

The seminar started with an opening act, with the presence of the following national and international authorities: Minister of Agriculture and Livestock Agr. Alfredo Molinas; Representative of IICA Office in Paraguay Dr. Alex Barril; President of CONACYT Ing. Ruben Stanley; Economic consultant of the EU Office in Paraguay Mr. Eric Dejoie and the Technical assistant of the Project .

After the opening act the Lic. Gonzalo Fuentes, moderator of the activity, explained the methodology to be used in the seminar. The explanation was followed by the presentation of the national reports of the participant countries (Argentina, Brazil, Paraguay and Uruguay – see Annex 4), by the representatives of each country:

Argentina: Agr. Ruth Heinz. Agricultural Technology National Institute (INTA).

Brazil: Dr. Paulo Peret. Ministry of Science and Technology.

Paraguay: Agr. Edgar Alvarez. Agricultural Research Office (DIA-MAG).

Uruguay: Agr. Sergio Ceretta. Agricultural Research National Institute (INIA).

In these reports the importance of the oleaginous chain in each country is pointed out, as well as the identification of the chain problems, opportunities and characteristics that influence the definition of priorities for its biotechnological development. The demands on biotechnologies identified at the national workshops were also highlighted.

5. DETERMINATION OF REGIONAL DEMANDS

5.1. DEMANDS SELECTION

The selection of biotechnological regional demands was made in three steps. The first one was to present and analyze in a plenary work the demands that were given priority in each country, in order to arrive at a consensus about the main regional topics and applications that may be of regional interest. The

second step was, working in groups on selected subjects, to define in a more precise way the topics and biotechnological applications as well as the concepts to consider in the future projects summons. The third and final step was, again a new working session in plenary, to confirm and arrive at a final consensus on the selected topics and applications to define the regional demand and, consequently, the options menu to prioritize when requesting for proposals.

5.2. PLENARY WORK

Once the national workshops results were presented by each country's coordinator, there was an opportunity to discuss the relative positions and developments in each country. There were questions about the presentations without deepening on the discussion at the moment. Paraguay's presentation pointed out the needs and demands of the oilseed chain organized on biotechnological techniques.

Afterwards, the analysis of the comparative demands that arose from the national workshops was presented by Ing. Marcelo Regunaga (Table 1). Exchange of ideas was made as well as values adjustment. Some countries pointed out the differences among the science and technology systems of each one of the countries and thus the different approaches and needs of the participants.

After the discussion, an agreement among the countries came up to focus the efforts on solving the problems of soybean production, leaving sunflower production to a second place.

The difference in the expression of demands of Paraguay is considered, and it is proposed to develop a regional position in order to close the technological gap through the deepening of the cooperation among countries. It is pointed out that the organization based on biotechnological techniques might be subordinated to the expression of demands through the chains problems, but only and if it takes into account the important differences that exist on the relative development of the science and technology systems, and that these types of projects should promote the equilibrium among the systems or it will deepen one of the most important regional weaknesses. After this, the Paraguayan representation adjusts the values, taking the organizational form chosen by the other three countries. Lunch is served, but the discussion relative to the type of division to be considered to organize the sub-group work remains open.

The plenary work continues with the appreciation to the deep agreement that exists on the valuation of the biotic and a-biotic stress resistance topics, and to the oil quality and protein quantity topic as a first approach to organize the

discussion. After analyzing the rest of the topics, it is decided to concentrate on three topic areas and organize three sub-groups that will propose the formulation to be presented to the CADB. The resulting sub-groups are organized based on the following topics:

Subgroup 1 – “Biotic stress resistance”.

Subgroup 2 – “Abiotic stress resistance”.

Subgroup 3 – “Quality”.

5.3. RESULTS OF THE GROUPS

The groups worked on developing discussions that enriched the countries' positions and allowed to shift from the national vision to the regional vision.

After these discussions each sub-group made a presentation to the plenary, starting a rich discussion from two topics that were really stimulating, one proposed by the sub-group of quality and the other one by the subgroup of biotic stress resistance.

The result of the sub-groups work is the following:

Subgroup 1 – “Biotic stress resistance”

Table 2. Outstanding problems and biotechnological approach to solve them.

Problem	Biotechnological approach / way of action
Leaf spot	<ul style="list-style-type: none"> * Identification of SNP's markers associated to resistance genes in soybean leaf spot. * Genetic mapping of resistance genes * Functional identification of candidate genes * Differential varieties racial characterization
Bug	<ul style="list-style-type: none"> * Survey of bug populations variability in the region * Knowledge strengthening of plant-insect interaction * Survey of variability of germoplasm (soybean) behaviour to bug attack.
<i>Macrophomina</i>	<ul style="list-style-type: none"> * Identification of SNP's markers associated to <i>Macrophomina</i> resistance genes. * Genetic mapping of resistance genes

The work about resistance to biotic stress (Table 2) concludes that the main problem for the region is the identification of the Asian soybean leaf spot, appearing as main research line the one of specific markers related to disease resistance genes, which has great probability of success and of immediate application on genetic improvement programs along the region

A discussion started pointing the scarce knowledge about the host-parasite relationship on the complex of soybean bugs. This topic may appear as a research process previous to its biotechnological approach. The impact of this problem on the production of soybean is stated, and it is also proposed the funding orientation towards projects not only for the development of already advanced research processes, but also to new problems and to the possibility of broadening the research fronts considering new and with high impact problems. The development of new capacities will be the most important when establishing the importance of the topics to be promoted.

In relation to *Macrophomina*, although it is a problem that affects mainly Paraguay and Brazil, it is considered an emerging problem and in real expansion. Research lines that may be faced to find a solution to this problem are very similar to those outlined for the Asian soybean spot.

Subgroup 2 – “Abiotic stress resistance”.

Table 3. Outstanding problems and biotechnological approach to find a solution.

Problem	Biotechnological approach
Drought and high temperature	<ul style="list-style-type: none"> * Functional study of candidates genes (genotyping of different varieties and evaluation of genes expression under controlled conditions). * Validation of methodologies to evaluate abiotic stress response (“phenotype”) in different development stages. * Bioinformatic integration and analysis of different outstanding information sources (phenotypic, molecular, biochemical, environmental, etc) for the regional projects
Biological fixation of N₂	<ul style="list-style-type: none"> • Characterization of microorganisms species and biotypes to develop new inoculants.

In relation to the proposal of the Abiotic stress resistance subgroup, the problem of drought resistance is considered strongly outstanding (Table 3), as well as the variability of the rain regime in the countries of the region, its relation with the soils water storage capacity and the influence of the hydric deficit during the different plant phenological stages.

A strong emphasis is given to the use of soybean germoplasm already characterized by hydric stress tolerance, in order to evaluate the genes expression under controlled conditions of water scarcity.

Countries showed real interest in developing researching activities related to the selection of more efficient biotypes to biological nitrogen fixation.

Subgroup 3 – “Quality”.

Table 4. Outstanding problems and biotechnological approach to find a solution.

Problem	Biotechnological approach
Protein	IT IS NOT RECOMMENDED TO MAKE EFFORTS IN THIS AREA
Oil	<ul style="list-style-type: none"> * The improvement of the oil quality, modifying the fatty acids profile towards larger contents of oleic acid, for edible use as well as for biodiesel. * Markers use for quality improvement.

For this summon, the quality subgroup proposes to concentrate on oil quality value (oleic high) and not on the protein value (Table 4), based on the capacity of the science and technology systems and on the present chain demands. Part of the discussions of national workshops is recovered referring to the importance of the sunflower production and its relative advances in relation to soybean. It is outlined the possibility of using tools that already exist in the countries and develop an application from its origin for sunflower towards the soybean demand.

The question is if the importance to the oleic value is given by the present development of the chain which is mainly focused on oil production, though this is slowly shifting from soybean production to meat production food. However, it is decided to endorse and propose what was presented by the subgroup, considering the clear endorsement given by the private sector to this approach.

5.4. VALIDATION PLENARY

The plenary confirmed the selection of subtopics and biotechnological applications made by the groups, including its explanations and table 5 was elaborated.

Table 5. Topics given priority at regional level

PRIORITIES	ABIOTIC	BIOTIC	QUALITY
1	Drought	* leaf spot * bug	Oil
2	Biological fixation	<i>Macrophomina</i>	
3	High temperature		

The groups were asked to reach an adequate articulation and topic expression mechanism for the project presentation summons for each topic of common interest.

TABLE 1. OILSEEDS CHAIN PRIORITIZATION, IMPACT AND AVERAGE FEASIBILITY OF THE TECHNOLOGICAL DEMANDS FOR THE FOUR COUNTRIES.

Subjects and biotechnological applications.	ARGENTINA			PARAGUAY			URUGUAY			BRAZIL		
	Prior	Feas	Impact	Prior	Feas	Impact	Prior	Feas	Impact	Prior	Feas	Impact
Abiotic stress resistance												
Soybean: Drought	4,5	3	5	4,9	1	5	5	4,5	5	4,5	3	4
Soybean: Salinity	4,5	3,5	4,5							4	2,5	4
Soybean: High temperatures	4	3	4				4	4	4	4	3	3
Soybean: Sensitivity to rain excess during harvesto (grain quality)										5	4	5
Sunflower: Drought	5	3	5				4	4	4			
Sunflower: Salinity	4,17	3,5	4,5									
Sunflower: Cold	4,5	3,5	4,5									
Biotic stress resistance				4,5	2	5						
Soybean: bugs	4,34	4	4	4,9	1	5	5	4	5	4	4	4,5
Soybean: lepidopters	4,17	5	3,5	4,9	1	5	5	4	5	4	5	3,5
Soybean: "Picudo" (<i>Sternechus</i>)	3	4,5	3									
Soybean: leaf spot	4,34	4,5	3,5	4,9	4	5	4	4	4	5	4	5
Soybean: <i>Phytophthora</i>	4	4,5	3							3	4,5	3
Soybean: <i>Sclerotinia</i>	3,5	5	3							3	4	3
Soybean: <i>Fusarium</i>	3,5	4	3							3	4	3
Soybean: <i>Macrophomina</i> (<i>Soybean stem blight</i>)	3,17	3,5	3	4,9	4	5				4	4	4
Soybean: Nematodes	3,5	5	3	4,9	4	5				4,5	4,5	4
Soybean: PBMV Virus	3,17	5	2,5									
Soybean: Weeds	4,25	5	4									
Sunflower: Lepidopters	4,34	4,5	4									
Sunflower: <i>Verticilium</i>	4,5	4,5	4									
Sunflower: <i>Sclerotinia</i>	4,25	4,5	3,5									
Sunflower: <i>Mildiu</i>	4,5	5	3,5									
Sunflower: Roya	3,67	5	3									
Sunflower: <i>Phomosis</i>	3	3,5	2,5				4,5	4	5			
Sunflower: SUMCOV Virus	3,34	5	2,5									
Sunflower: Weeds	4,5	5	4									
Peanut: Soil fungi	4,5	3,5	4									
Colza: <i>Sclerotinia</i>	4,5	4	3									
Germoplasm bank (diversity, phenotypical tipification, genotypic tipification,)	4	5	3							4,5	4,5	5

FISIOLOGICAL TRAITS												
Soybean: Nitrogen fixation.	5	4	4	4	4	3	3,5	3	3	5	4,5	4
Sunflower: Early dying.	4,5	4	4									
Production Management improvement, intersowing, direct tillage (production cycle manipulation)	3,67	3	4,5							3	3	3
Efficiency of use of non renewable nutrients	3	2	3,5							4	2,5	4
Phenological management	2	3	2	4,3	5	5						
QUALITY												
Protein content increase in soybean	3,84	3,5	4,5							3,5	4	3,5
Increase and modification of the soybean oil content for biodiesel, industrial and edible.	4	4	4,5	3,8	1	4	3	3	3	4	4	4
Increase and modification of the sunflower oil content for biodiesel, industrial and edible.	4,5	4,5	5									
Increase of the contents of specific compounds for functional foods.	3,33	3	3							2,5	3	2,5
Sunflower with larger oleic acid content.							2	4	3			
Protein quality in soybean.				3,8	4	5	3	4	3,25			
Nutraceutical use valuation.							3	5	3			
Antinutrients	3,33	5	2									
Phitates	2,5	5	2									
ENVIRONMENTAL IMPACT												
Gliphosate Management resistance.	3,84	3	4,5							3	3	3
Restriction Technologies.	3	3	4									
BIOFERTILIZERS												
BIOINDUSTRIES												
Heterologeous proteins expression.	4	5	3							3,5	2	3
Tools to characterize and differentiate varieties.	3	5	5							4	4,5	4,5
Genetic plants transformation												
Improvement through molecular markers (Sunflower, Canola, Oily Peanut)				3,8								
Genes / plastids transference				2,7								
Genetic variability												
Genes functionality				3,3								
Interesting genes expression				5								
Interesting genes expression in the improvement of the oily				3,8								

quality of soybean												
Insertion of resistant genes to biotic and abiotic factors.				4,4	2	5						
Biotechnology applied to the biological cycle												
Hybrids production				3								
Flowering inhibition				3								
Yield increase / improvement (QTLs)				4	4	5						
Sterility induction in males, improvements of flowering times				3								
Genomic and proteomic												
Resistance to biotic and abiotic factors				4,95	3,5	5						
Soybean new varieties				4,55	3,5	4						
Plant nutrition, use of nanovesicles for plant nutrition efficiency				2,3								
Metabolomic				2								
Other subjects and applications												
Pests and diseases detection and characterization				4,7								
Colza without dehiscence (biodiesel use)							4	4	3,5			

6. ANNEXES

Annex 1. List of participants and represented institutions

COUNTRY	NAME	INSTITUTION
URUGUAY	Daniel Bayce	Cámara Uruguaya de Semillas
	Laura Franco Fraguas	Facultad de Química
	Enrique Castiglioni	Facultad de Agronomía
	Ismael Turban	El Tejar
	Gonzalo Souto	OPYPA / MGAP
	Sergio Ceretta	INIA-Estanzuela
ARGENTINA	Ruth Heinz	INTA
	Mercedes Scandeceni	
	Alberto Escande	INTA Balcarce
	Rodolfo Rossi	Nidera SA
	Yanina Yalungo	SAGPyA
BRAZIL	Francimar Correa	EMBRAPA -CNPSO - Londrina
	Paulo Péret	Ministerio de Ciencia y Tecnología
	Maria Helena Bodanese Zanettini	Universidad Federal de Rio Grande do Sul
	Gutemberg Delfino	
PARAGUAY	Edgar Álvarez	DIA/MAG
	Wilfrido Morel	CRIA/DIA/MAG
	Lider Ayala	FCA/UNA
	Nancy Villalba	FCA/UNA
	Ricardo Pedretti	INBIO
	Estela Ojeda	APROSEM
	Inocencia Peralta	CEMIT/UNA
	José Schwartman	CONACYT
	Denice Álvarez	FACEN/UNA
	Crisanta Rodas	DIA/MAG
	Víctor Santander	DIA/MAG
	Graciela Gómez	IICA/Paraguay
CADB	Fabián Capdevielle	CADB Uruguay
	Gabriela Ciocca	CADB
MANAGEMENT UNIT	Marcelo Regúnaga	Proyecto BIOTECH
	Inés Dorrego	BIOTECH

Annex 2. Programme



PROGRAMME OILSEEDS CHAIN REGIONAL SEMINAR April 10, 2008 – Asunción, Paraguay

- 08:30** Participants accreditation
- 09:00** Explanation of the Activity objectives
Responsible: Biotechnology Development Support Commission Focal Point (CADB) Uruguay
- 09:15** Explanation of the methodology to be used and personal presentation of the participants.
Responsible: Moderator
- 10:00** Presentation of the chain and demands from Argentina
Responsible: Argentina Chain representant
- 10:30** Presentación de la cadena y las demandas de Brasil
Responsible: Representante de la cadena por Brasil
- 11:00** Coffee break
- 11:15** Presentation of the chain and demands from Paraguay
Responsible: Paraguay Chaín representant
- 11:45** Presentation of the chain and demands from Uruguay
Responsible: Uruguay Chaín representant
- 12:15** Break
- 12:30** Program BIOTECH launching act with national authorities and press.
Responsible: CADB focal point.
- 13:30** Lunch
- 14:30** Explanation of the final demands selection procedure.
Responsible: CADB representant
- 15:00** Presentation of demands matrix given priority
Responsible: MERCOSUR – BIOTECH Biotechnologies support program international technical assistance representative.
- 15:30** Analysis in plenary of the presented matrix
Responsible: Moderator
- 16:00** Groups work to write down a conceptual explanation of the topics given priority
Responsible: Moderator
- 17:30** coffee break
- 18:00** Final plenary: validation of prioritized subjects
- 19:30** End of workshop
- 21:00** Good fellowship dinner. Hotel NH Columbia, Restaurant

**IICA Meeting Room
Juan E O'Leary 409 y Estrella
Parapiti Building- 5º Floor
ASUNCION**