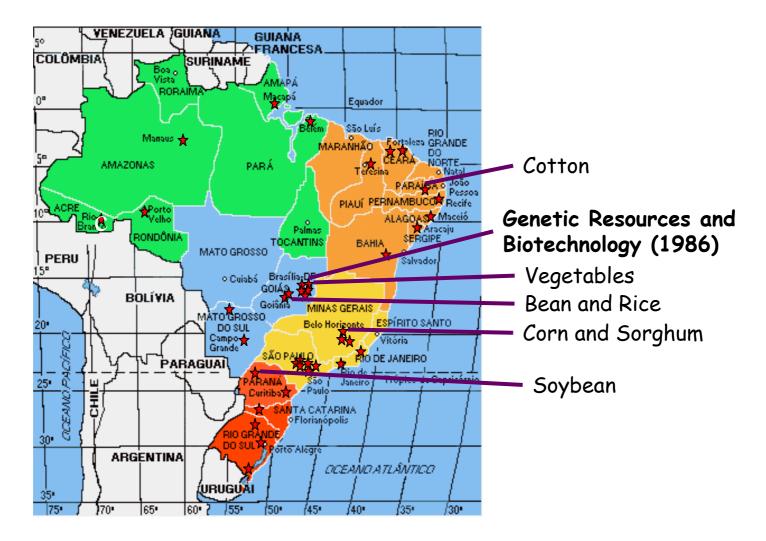


Development of transgenic technologies: generation of the first commercial transgenic varieties in Brazil

Francisco J. L. Aragão Embrapa/Cenargen, Brazil

aragao@cenargen.embrapa.br





42 Research Units 2,500 PhD researchers

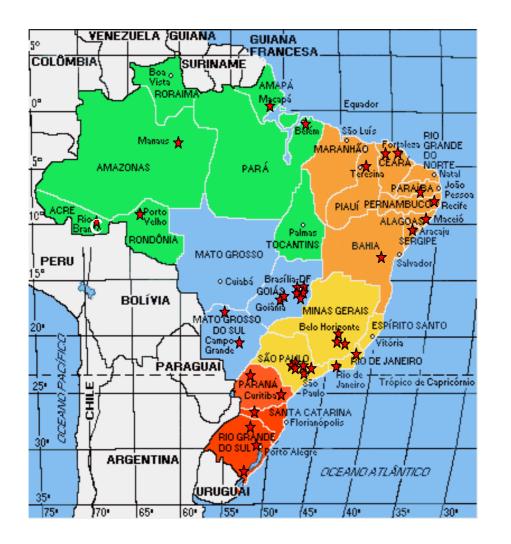


1986 – Agricultural Biotechnology Program

Biotechnology Unit – Brasília







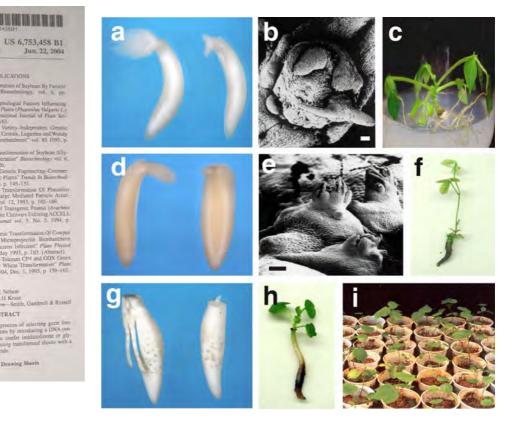
Lettuce Cotton Dry Bean Soybean Potato Banana Papaya Brachiaria Tomato Coffee Maize Castor Bean Cowpea



1996 - Embrapa/BASF - Development of a Production system (Cultivance®) for soybean

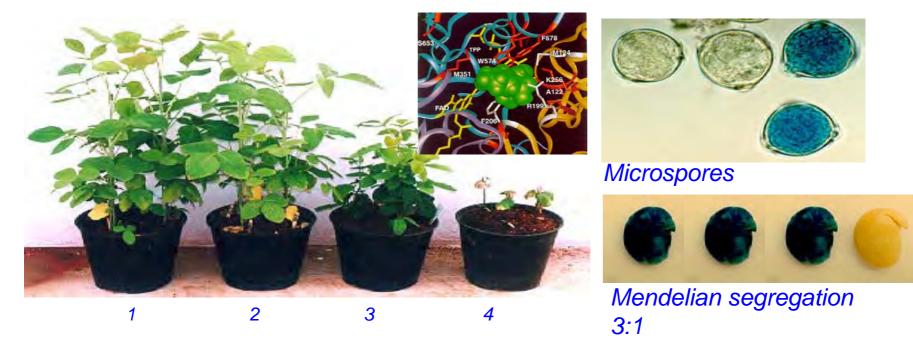
| | | US0067534 | |
|--|---|--|--|
| | (12) United States Patent Filho et al. | (10) Patent No.: (45) Date of Patent: | |
| | (34) PROCESS FOR OBTAINING TRANSGENIC LEGUMINOUS PLANTS (LEGUMINOSAE) CONTAINING EXOGENOUS DNA | OTHER PUBL McCabe et al. Stable Transform Acceleration. Aug. 1988, Bi | |
| | (75) Investors: Elibio Leopoldo Rech Elho, Brasilia (BR), Francisca José Lima Aragão, Brasilia (BR) | 923-926.* Aragan, E.J. L. es al. "Morph Recovery of Transgenic Beats /? of a Canoca Cultivar" Interna | |
| REFERENCE | (3) Assume: EMBRAPA-Empress Brasileira de Pesquisa Agropecturia, Brasilia (BR) | ences 158 (2) 1997, p. 157-16. Christou P. "Strategies For V. Transformation Of Important C. | |
| Annual Andrew | (*) Notice: Subject to any dischaimer, the term of this patent is excended or adjusted under 35 U.S.C. 154(b) by 0 days. | Species Utilizing Particle Bor 13-27. McCabe, D. et al. "Souble Tran | |
| CARTA P | (21) Appl No. 09/509,982 | cine Max) By Particle Acceler No. 8, Aug. 1988, p. 923-926. | |
| CARIAD | (22) MTT Filed. Oct. 7, 1997 | Christon, P., et al. "Soybean Ge | |
| | (86) PCT No. PCT/BR97/08053 | cial Production of Transgenic F ogy vol. 8, No. 6, Jun 1990, p | |
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| - | (87) PCT Putt. No. WO99/18223 | Brag, G., et al. "Recovery of " | |
| - | PCT Pub Date Apr. 15, 1999 | hypergara L.) Plants Form Elite Technology" The Plant Journ | |
| North Contractor Mill 77 | (51) Int. CL. ⁸ C12N 15/82, A0111 4/00 | 745-753 | |
| popular de lingua de la res los | (32) U.S. Cl. 800/278: 435/430; 435/470; | Kunonowicz, A., et al. "Geneta Vigna-Unguiculata Using M | |
| Co Casa da Publicado do Pada | 800/300; 800/312, 800/313 (58) Field of Search 435/468, 469, | and Agrobacterium-Tumefaci | |
| And Darks (paragraph Arr-(17 Arr) AR | 435/470, 436, 430, 430, 1; 800/278, 293, 300, 418, 419, 312 | (ROCKV) 102 (1 SUPL), Ma Zhou H, et al. "Glyphosate-T As A Selectable Marker In M Cell Reports vol. 15, No. 300 | |
| (76) Danier - Romania Marcare Pademan Raw Calden, 88-191 | (56) References Cited | * cited by examiner | |
| | U.S. PATENT DOCUMENTS | Primary Examiner Amy J. 1 | |
| (*) (houses - Arrents Mary Indentity Rev Calder, 55 Tol Reality | 4,940,835 A = 7/1990 ShiA et al. 435/320.1 5,477,060 A 12/1995 Sauma et al. 435/430 5,565,346 A 10/1996 Facolotti 800/293 | Axessiant Examiner David F (74) Attorney, Agent, or Firm | |
| Page in Waldate - 21 Lipite | 3.589,583 A 12/1996 Kiec et al. 800/298 3.830.728 A 11/1998 Christos et al. 435/720.1 | (57) ABST | |
| Frankline (4.5 Married | POREIGN PATENT DOCUMENTS | The invention relates to a pro- transformed leguminous plan | |
| (Path) | EP (101746) 2/1088 EP 0430311 6/1991 EP 0.430313 6/1991 EP 0.519758 (2/1992 | struct encoding a protein to phosate relistance and selecti low concentration of herbicid | |
| | Fit 27 Mar29 1/1997 WO WO92/ULLAN U/1997 | 9 Chaines, 2 D | |

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1996 - Production system Cultivance® 2003 - Second Elite Event (CV127)



- 1. Non-transgenic
- 2. Transgenic (line 8-19) after pulverization with the herbicide
- 3. Transgenic (line 7-15) after pulverization with the herbicide
- 4. Non-transgenic plant after pulverization with the herbicide



Imidazolinone tolerant soybean - Embrapa/BASF





Biosafety: safe or safer



Biosafety analisys by Embrapa and BPS



Molecular characterization

- Number of DNA inserts, insert stability
- Number of copies of genetic elements within the insert
- Integrity of gene cassettes
- Presence of additional DNA (backbone)
- Sequence of genomic flanking DNA
- Sequence of the inserted DNA
- DNA LandMarks



Protein characterization, Food / Feed safety

•Protein characterization and equivalence

- Protein level in plant tissues
- •Gram quantity protein production, purification, characterization
- •Allergenicity assessment
- Toxicity assessment



Agronomic equivalence, Environmental safety

Agronomic / phenotypic assessments

- •Weediness assessment (HT)
- Fitness
- Environmental safety
- Environmental fate

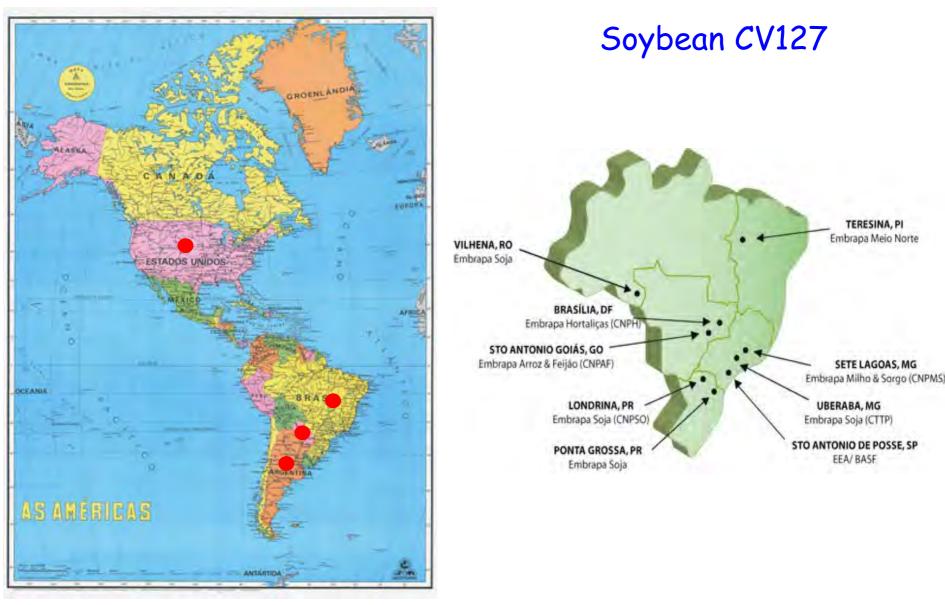


Composition equivalence, Nutritional equivalence

Grain samples from multi-location, multi-year, replicated field trials

- Secondary metabolites
- Pilot scale processing, nutrient / antinutrient analysis (validated methods)
- Confirmation of food/feed safety
- Animal feeding studies







Biosafety: safe or safer



Dec, 2008



Commercial release proposal

Submitted: USA, Canada, EU, Japan, China, Philippines, Korea and Brazil (Dec 2009)

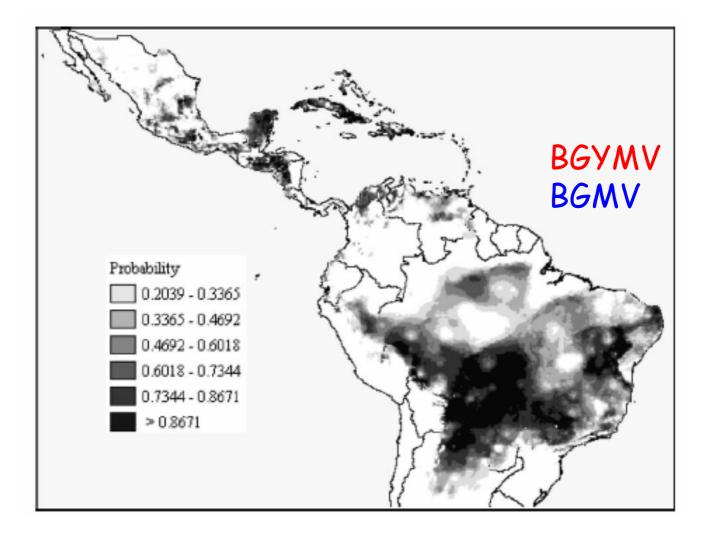
Submission in 2010: Argentina, Colombia, Taiwan, Australia, Russia, Mexico





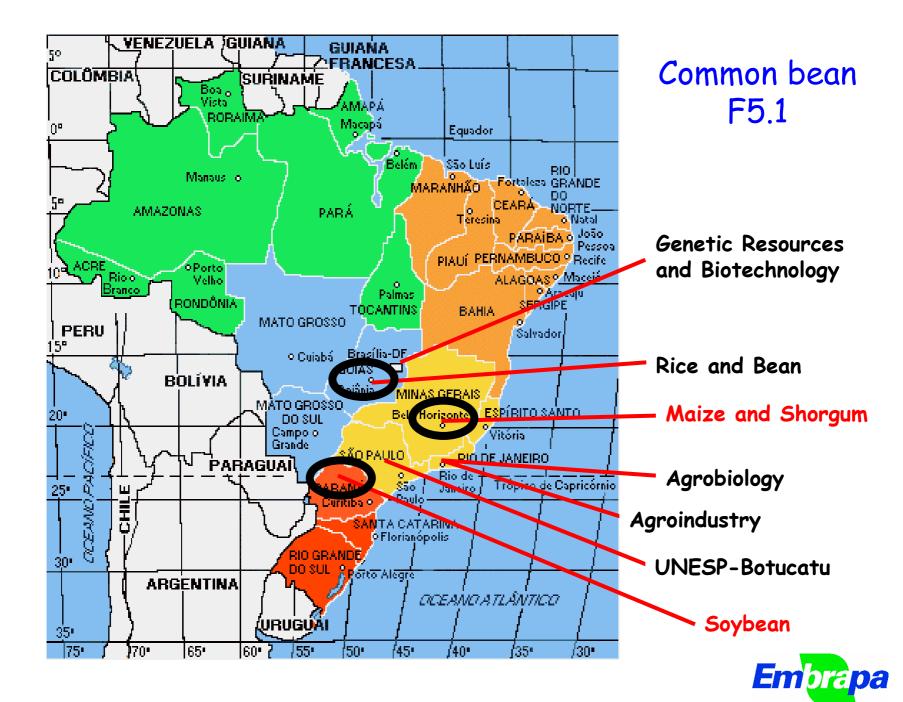
Golden mosaic causes annual reductions in the range of 90,000 to 280,000 tons (Brazil) Enough to feed 6 M to 20 M adults.

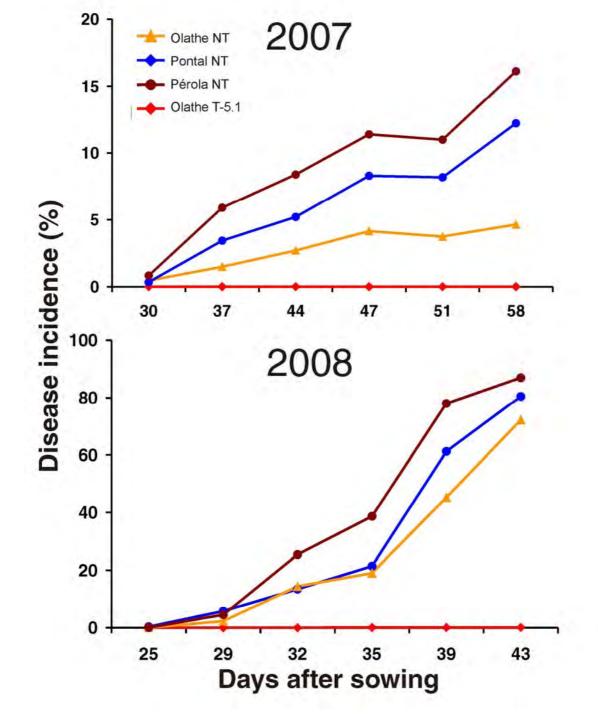




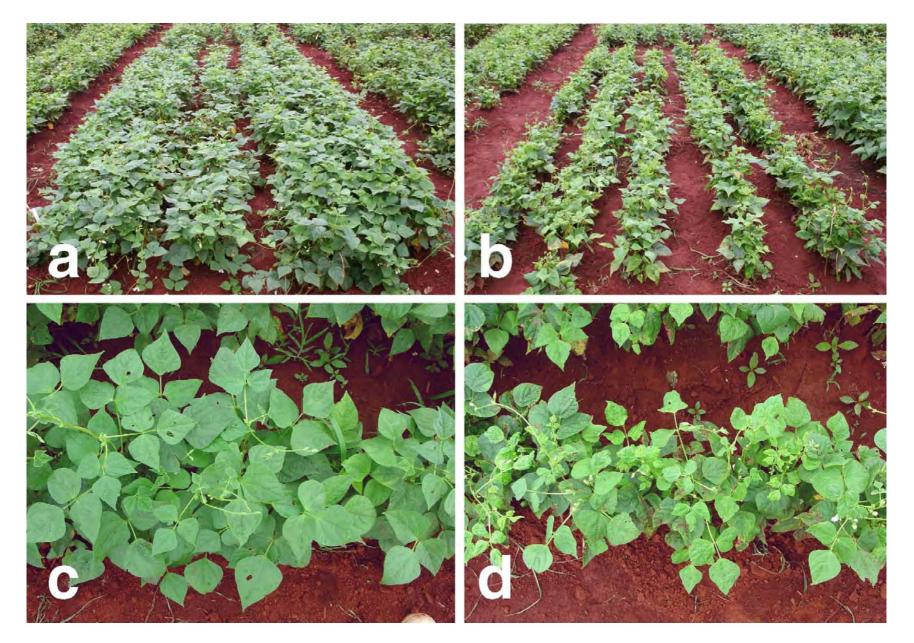
BGYMV-DR, -MX (83%), -FL 82% 44 bp sequence with no gaps

















Thank you Gracias

