The development of Embrapa 5.1- common beans resistant to the *Bean golden mosaic virus*

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Embrapa

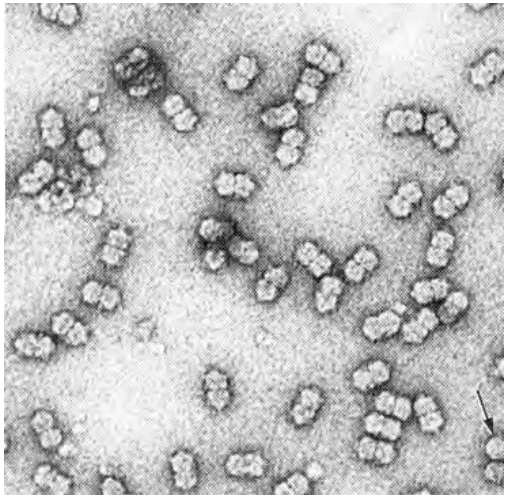
Ministério da Agricultura, Pecuária e Abastecimento

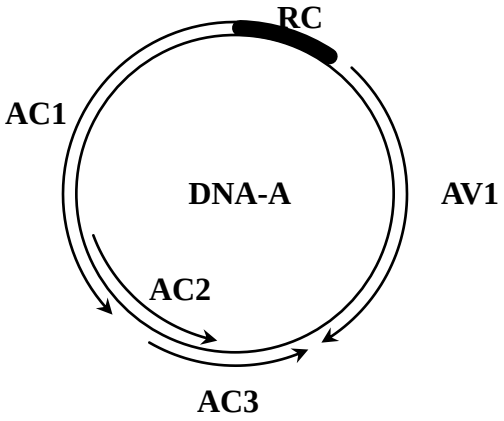
GOVERNO FEDERAL BRASIL PAÍS RICO É PAÍS SEM POBREZA

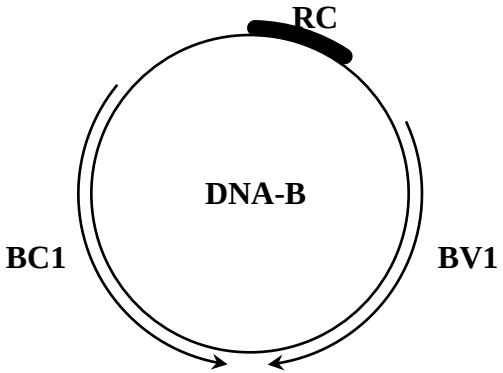
Golden mosaic causes annual reductions in the range of 90,000 to 280,000 tons (Brazil)

Embrapa

70s-
>15,000 accesses in Common Bean Germplasm Banks

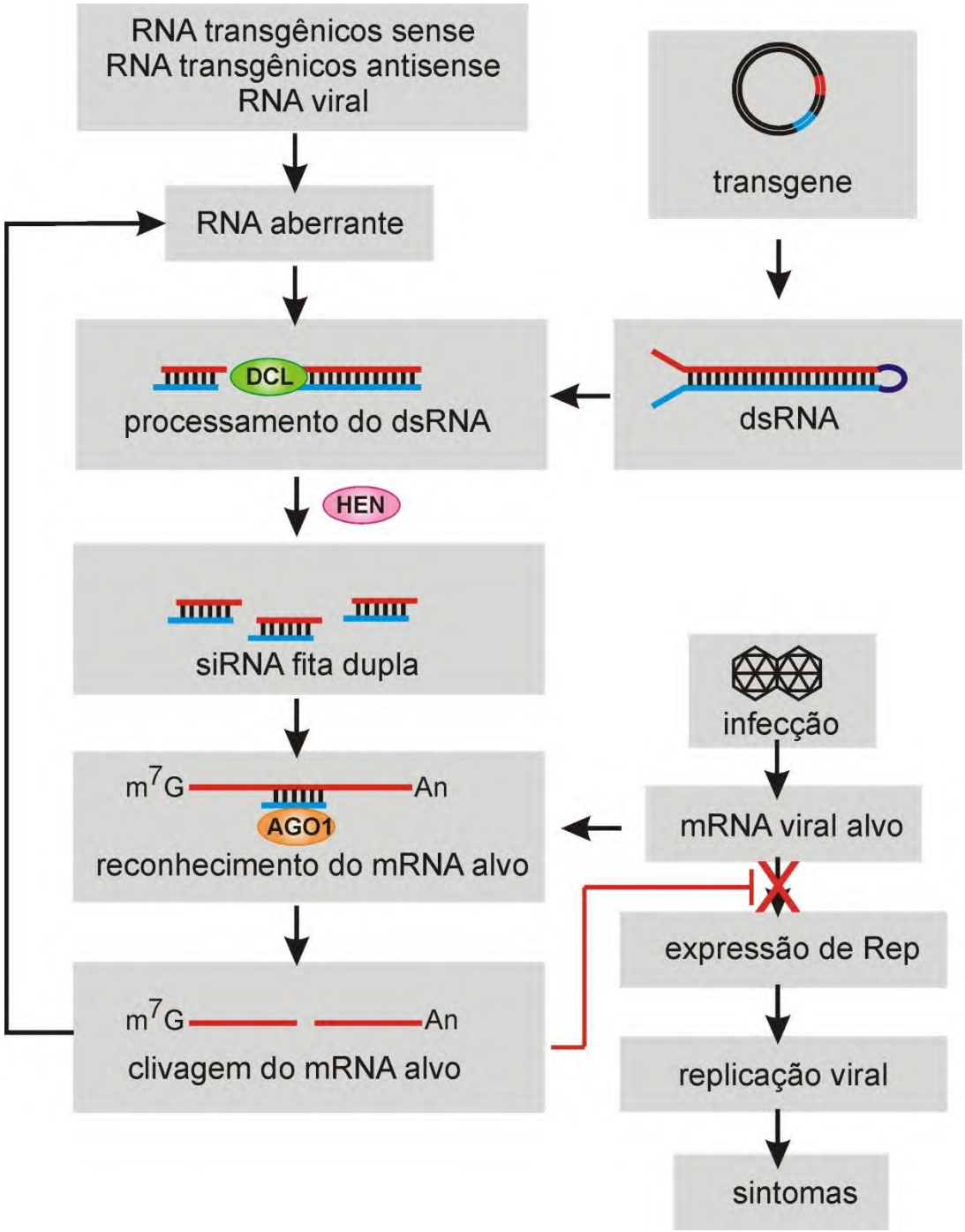


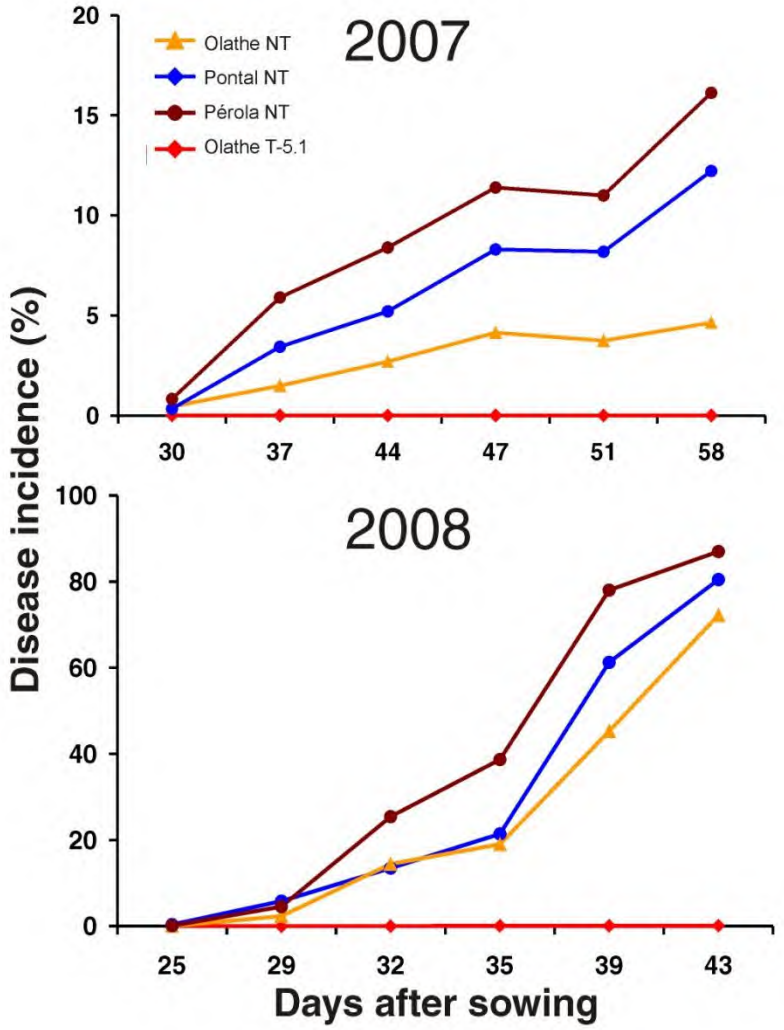




BGMV is transmitted by the whitefly *Bemisia tabaci* in a persistent, circulative manner

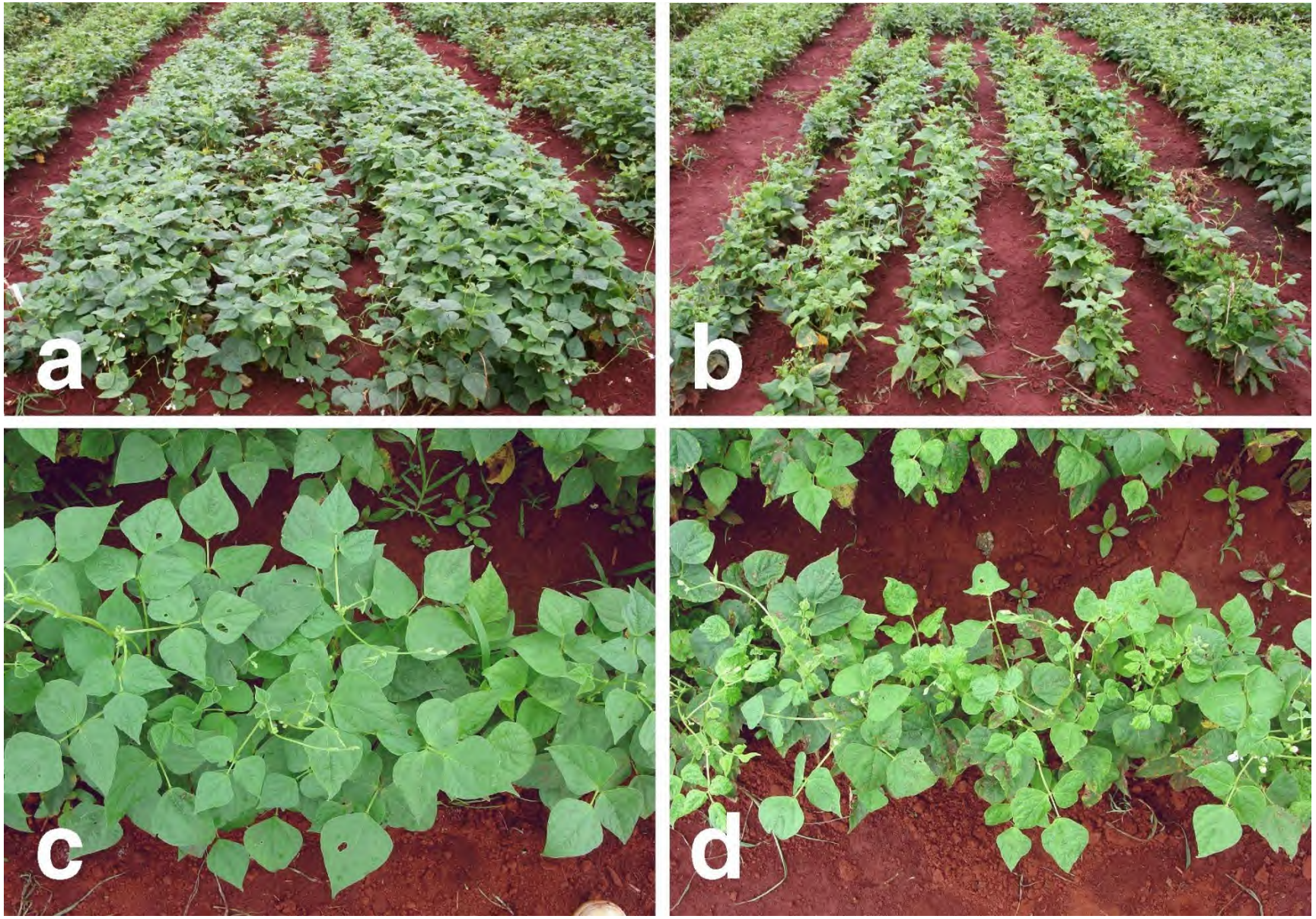
Embrapa


RNA transgênicos sense
RNA transgênicos antisense
RNA viral
transgene
RNA aberrante
DCL
processamento do dsRNA
dsRNA
HEN
siRNA fita dupla
infecção
m7G
An
AGO1
reconhecimento do mRNA alvo
mRNA viral alvo
m7G
An
clivagem do mRNA alvo
expressão de Rep
replicação viral
sintomas



Interfering RNA strategy

Aragão & Faria: Nature Biotechnology, 2009

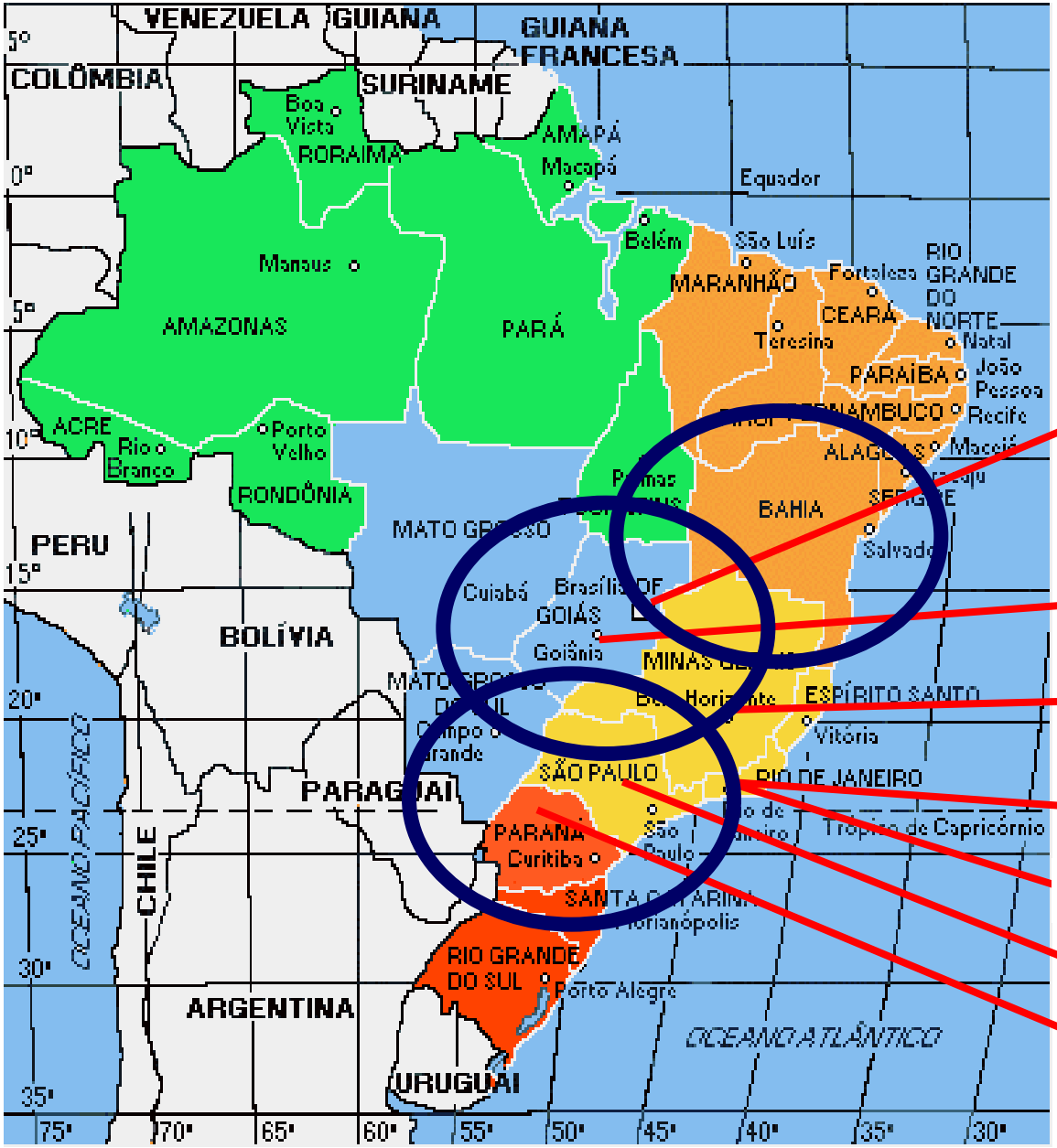

a
b
c
d

NORMATIVE RESOLUTION NO. 05, MARCH, 2008

Gives provisions on rules for commercial release of Genetically Modified Organisms and their derivatives

Portuguese:
http://www.ctnbio.gov.br/index.php/content/view/11444.html

English:
http://www.ctnbio.gov.br/index.php/content/view/12857.html



Common bean
Embrapa 5.1
EMB-PVØ51-1

Genetic Resources and Biotechnology

Rice and Bean

Maize and Shorgum

Agrobiology

Agroindustry

UNESP-Botucatu

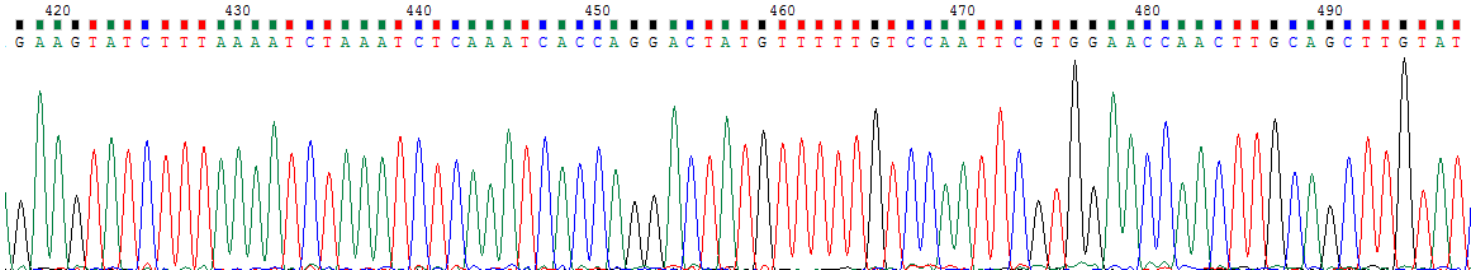
Soybean

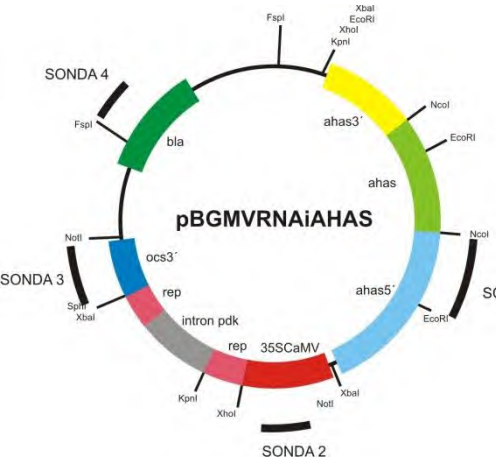
Embrapa

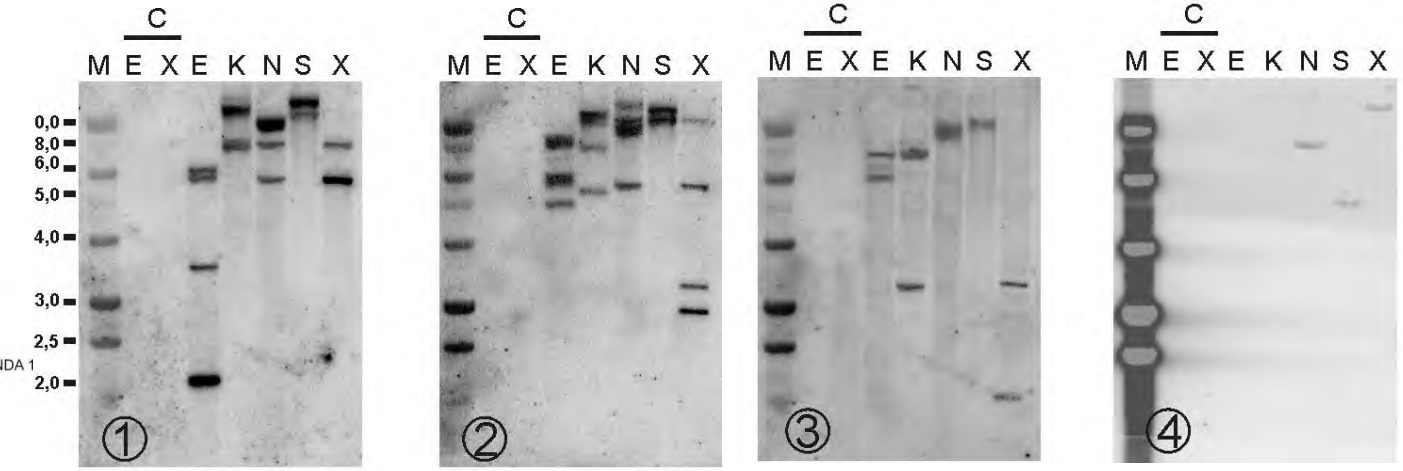
Molecular characterization

- 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

Embrapa

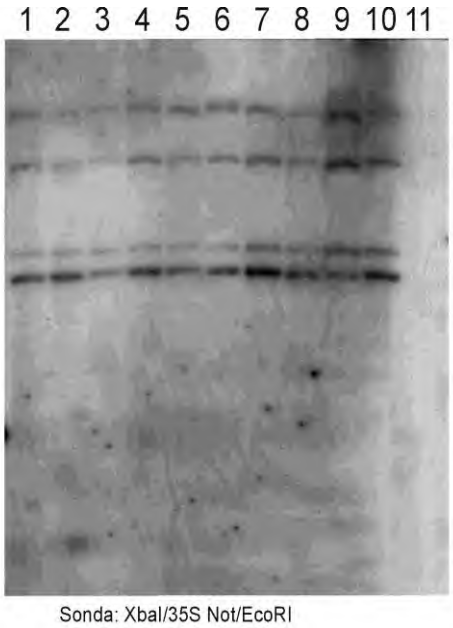




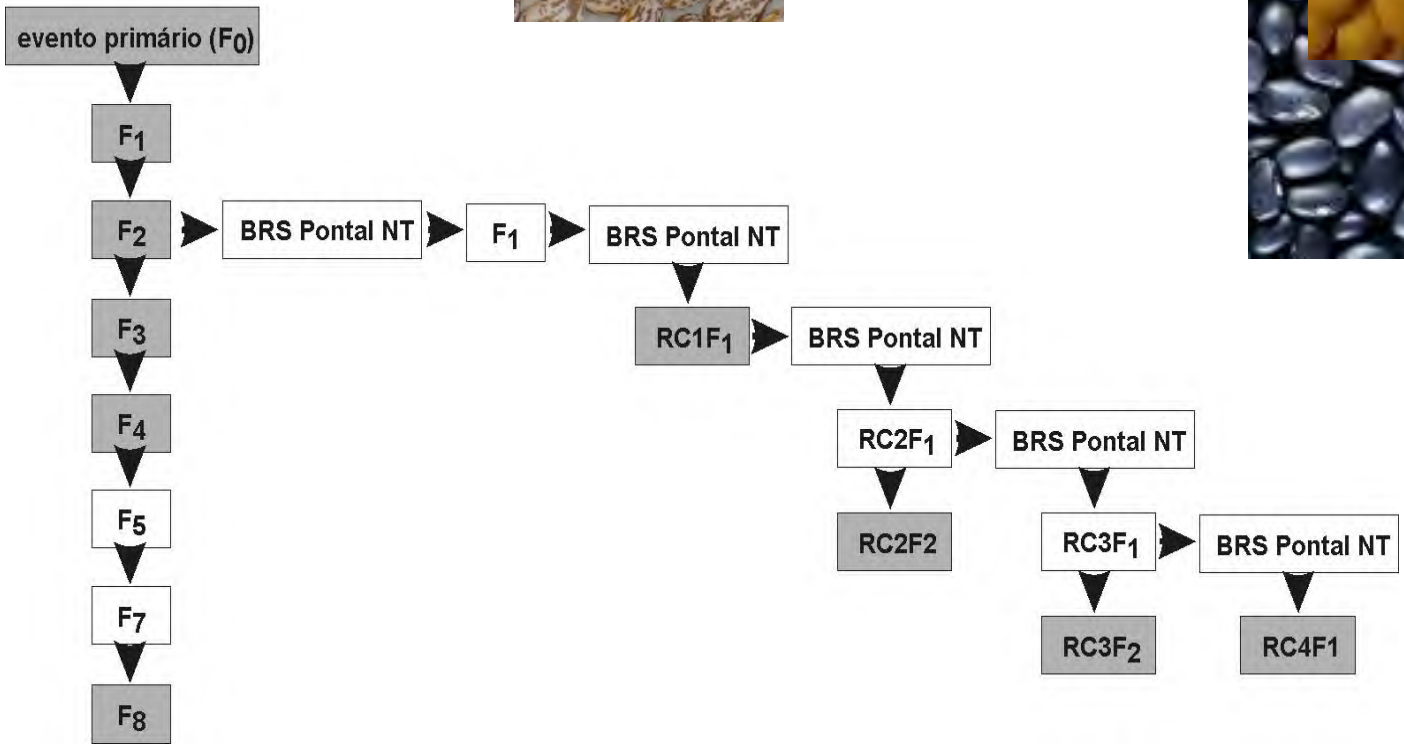


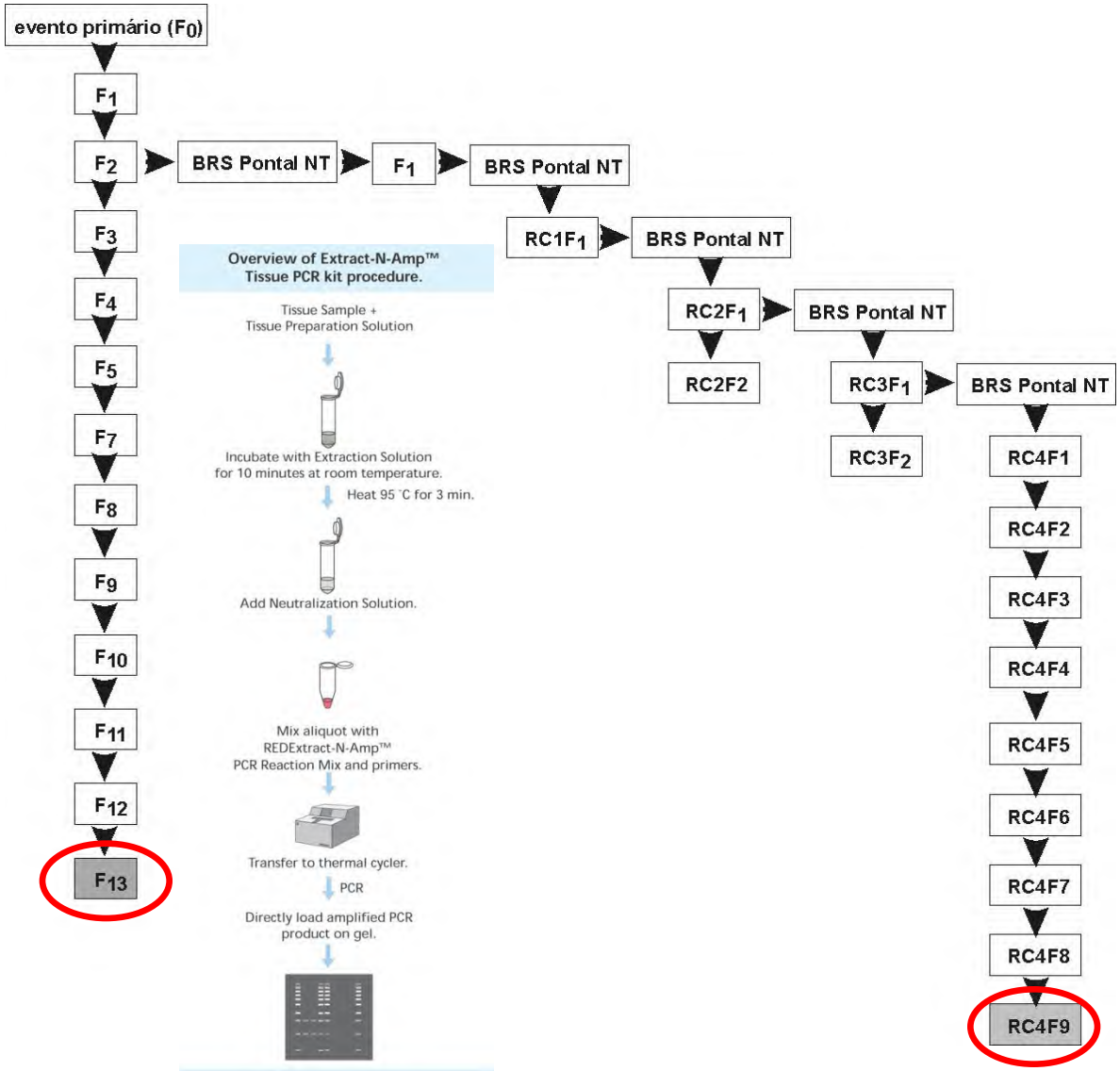
Gene *bla* não funcional

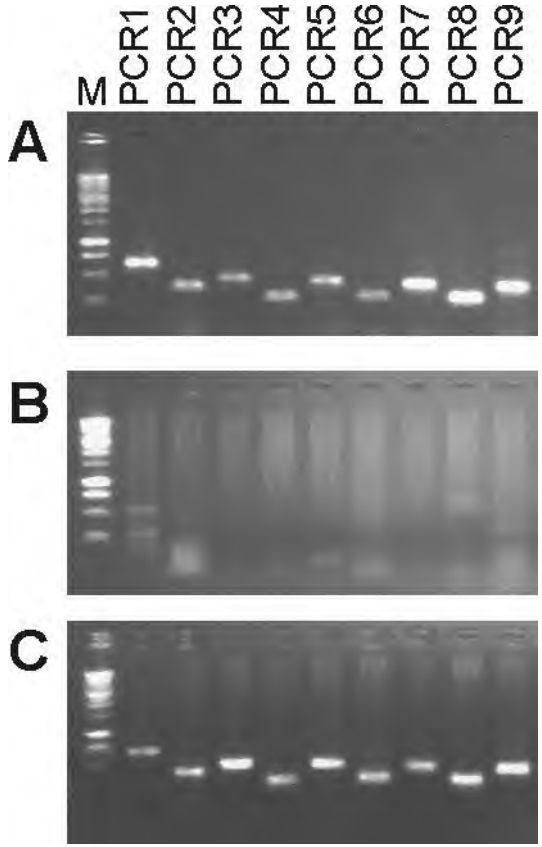
Single locus: segregation of: 3:1



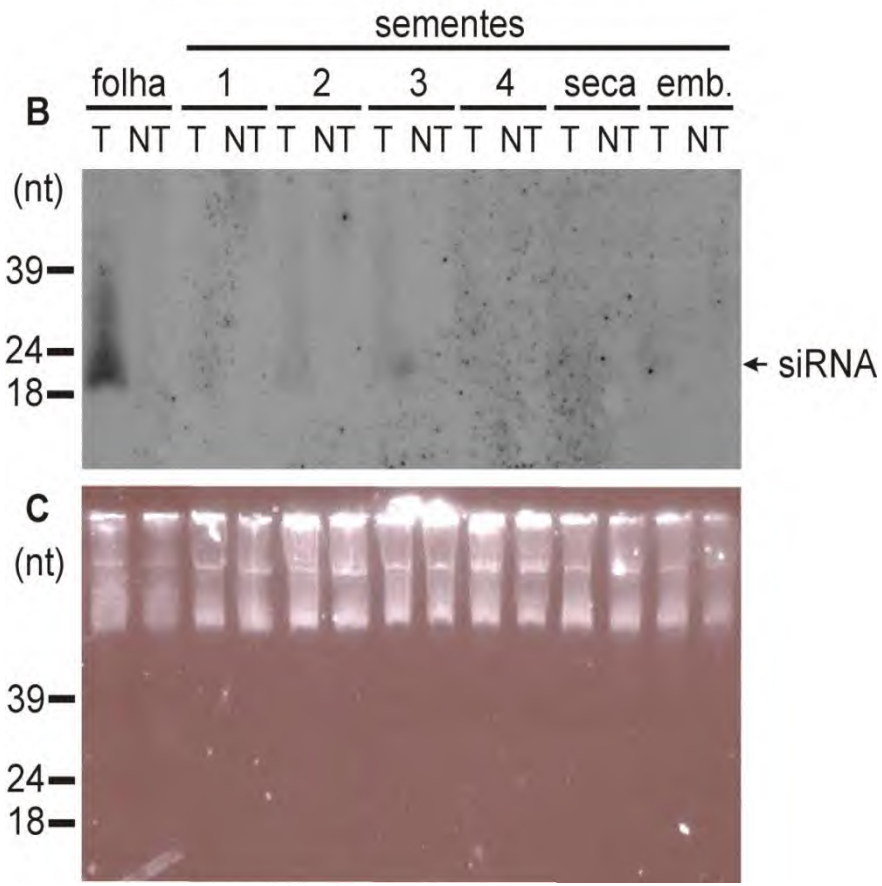
Stability
Generations x after sexual crosses

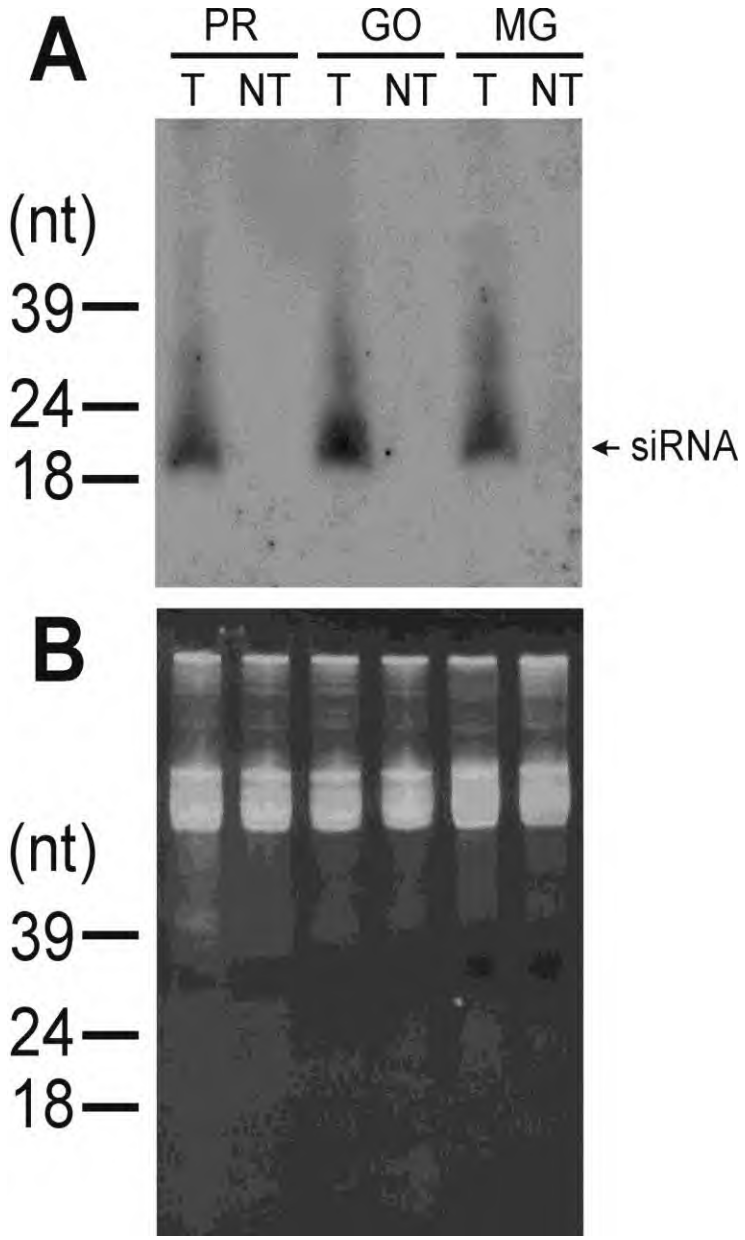



evento primário (F0)
F1
F2
F3
F4
F5
F7
F8
F9
F10
F11
F12
F13
BRS Pontal NT
F1
BRS Pontal NT
RC1F1
BRS Pontal NT
RC2F1
BRS Pontal NT
RC2F2
RC3F1
BRS Pontal NT
RC3F2
RC4F1
RC4F2
RC4F3
RC4F4
RC4F5
RC4F6
RC4F7
RC4F8
RC4F9
Overview of Extract-N-Amp™ Tissue PCR kit procedure.
Tissue Sample + Tissue Preparation Solution
Incubate with Extraction Solution for 10 minutes at room temperature.
Heat 95 °C for 3 min.
Add Neutralization Solution.
Mix aliquot with REDExtract-N-Amp™ PCR Reaction Mix and primers.
Transfer to thermal cycler.
PCR
Directly load amplified PCR product on gel.


M
PCR1
PCR2
PCR3
PCR4
PCR5
PCR6
PCR7
PCR8
PCR9
A
B
C

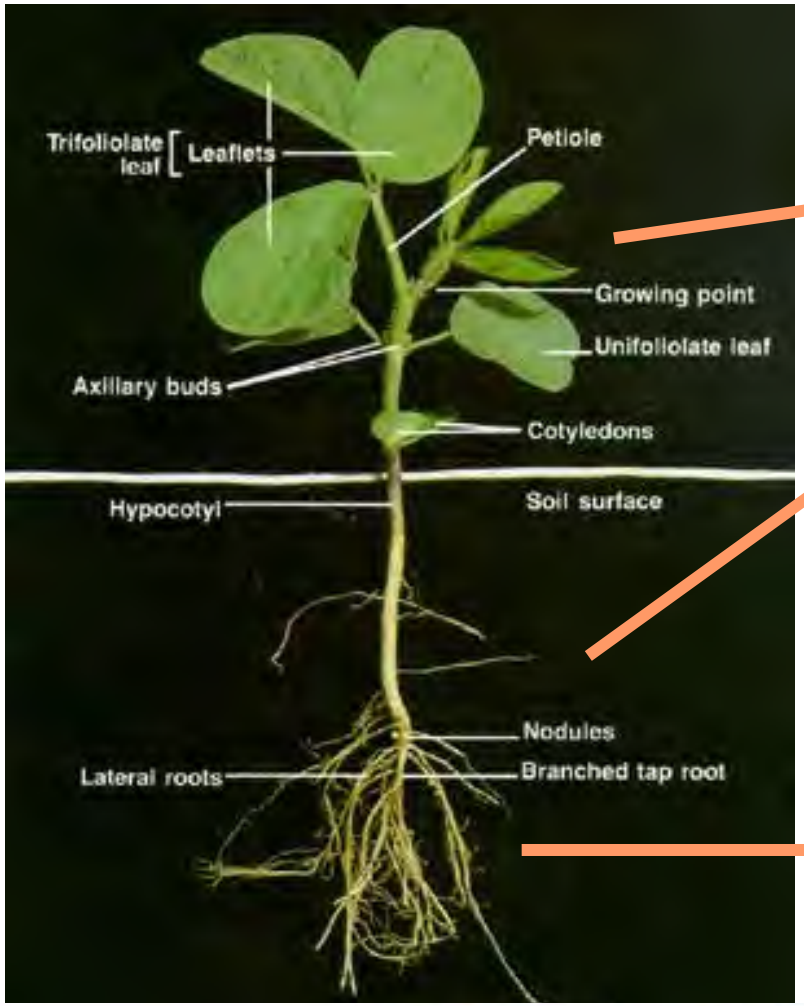

A
1
2
3
4

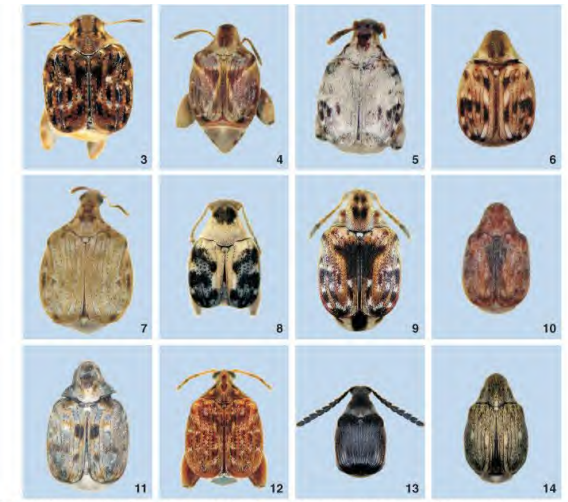

sementes
folha
1
2
3
4
seca
emb.
B
T NT T NT T NT T NT T NT T NT T NT
(nt)
39
24
18
siRNA
C
(nt)
39
24
18


A
PR
GO
MG
T NT T NT T NT
(nt)
39
24
18
siRNA
B
(nt)
39
24
18

Agronomic equivalence, Environmental safety

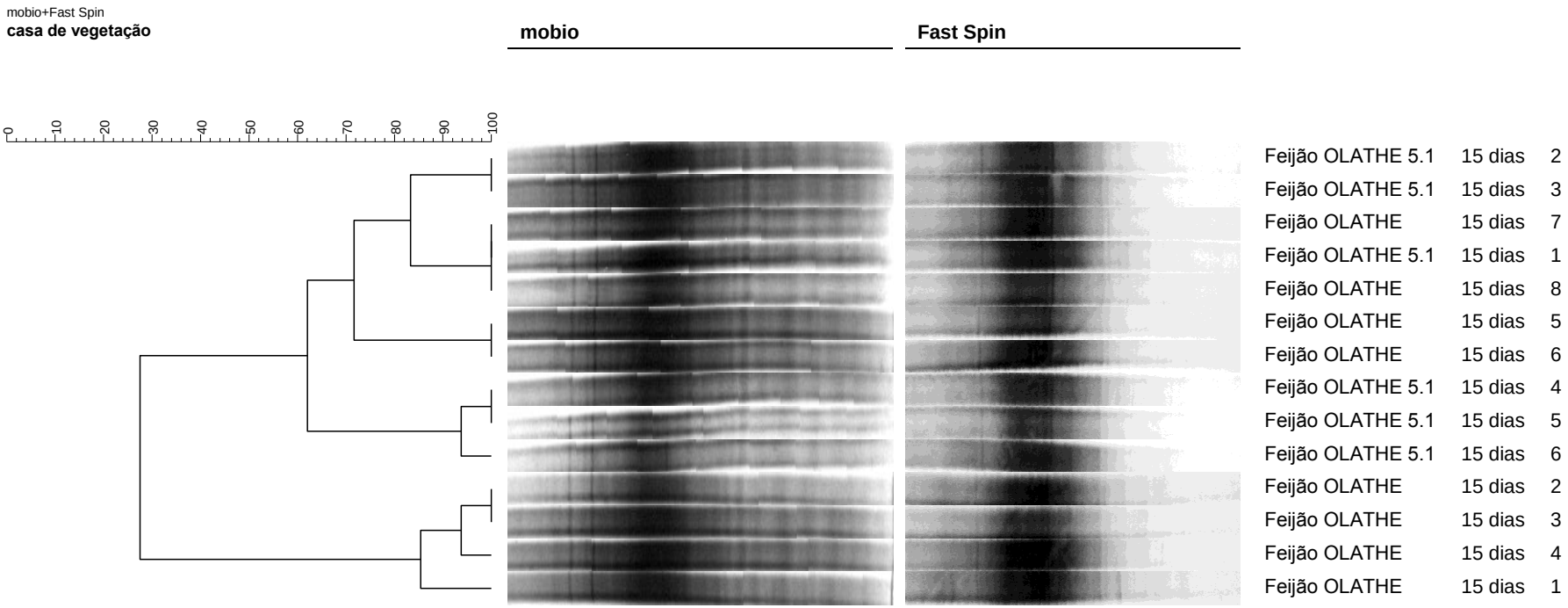
- Agronomic / phenotypic assessments
- Weediness assessment (HT)
- Fitness
- Environmental safety
- Environmental fate





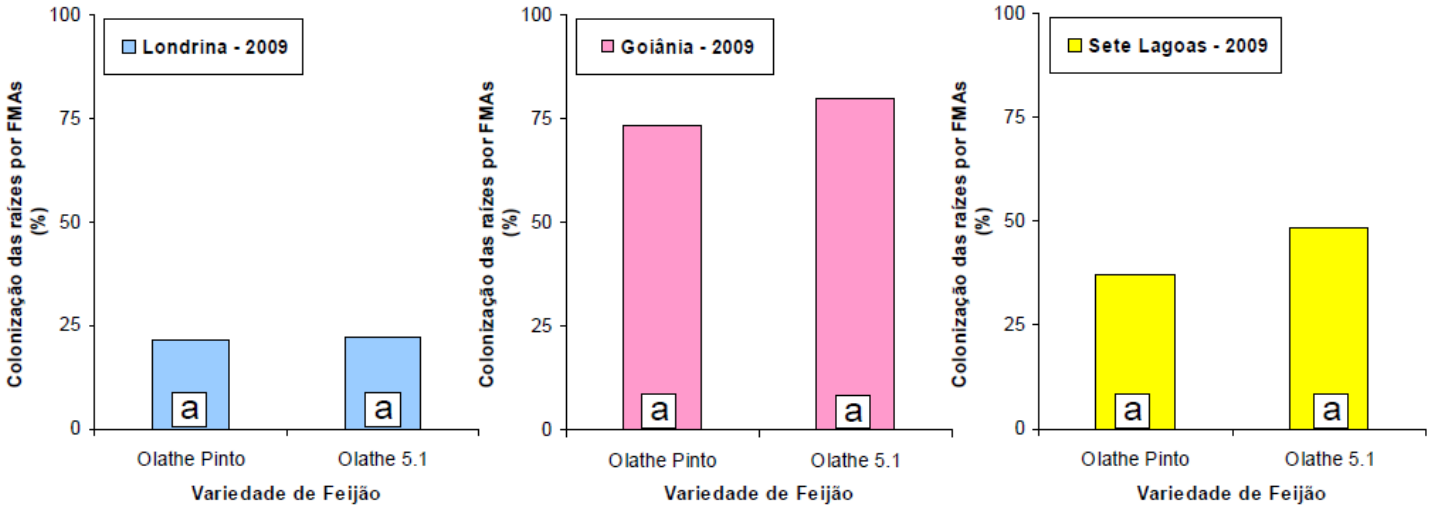
Figuras 3-14. Vista dorsal: (3) *Caryedes brasiliensis*; (4) *C. godmani*; (5) *C. helvinus*; (6) *C. paradisensis*; (7) *C. stenocephalus*; (8) *Ctenocolum colburni*; (9) *C. tuberculatum*; (10) *Gibbobruchus mimus*; (11) *G. scurra*; (12) *G. speculifer*; (13) *Meibomeus cyanipennis*; (14) *M. musculus*.

Embrapa

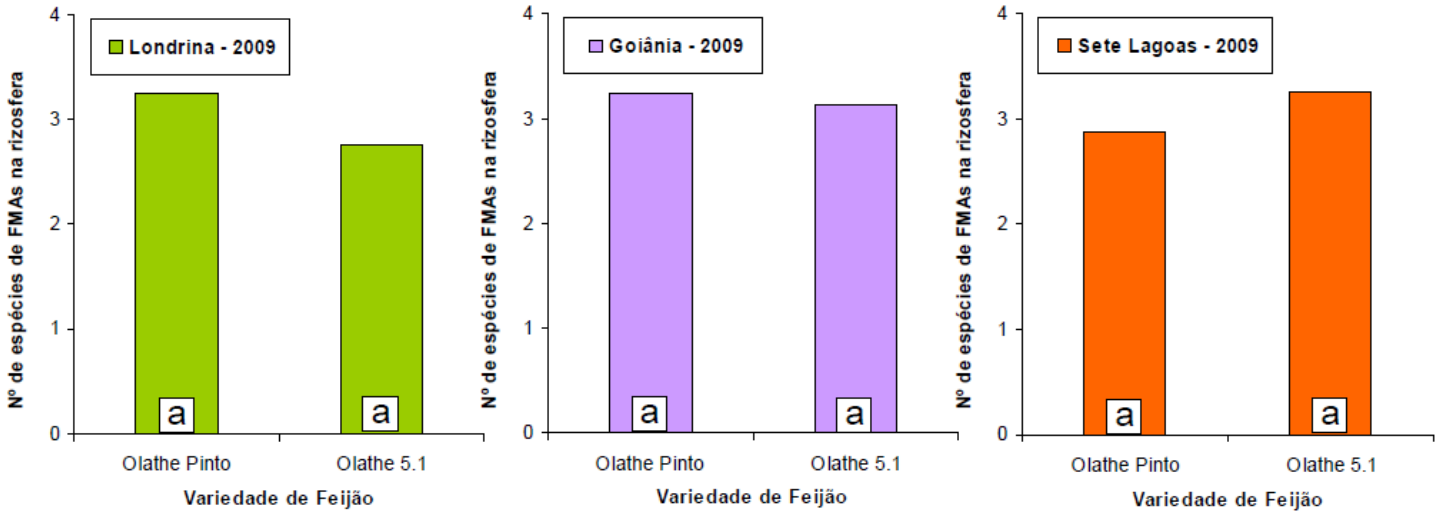


No consistent change of bacterial community based on 16s rDNA

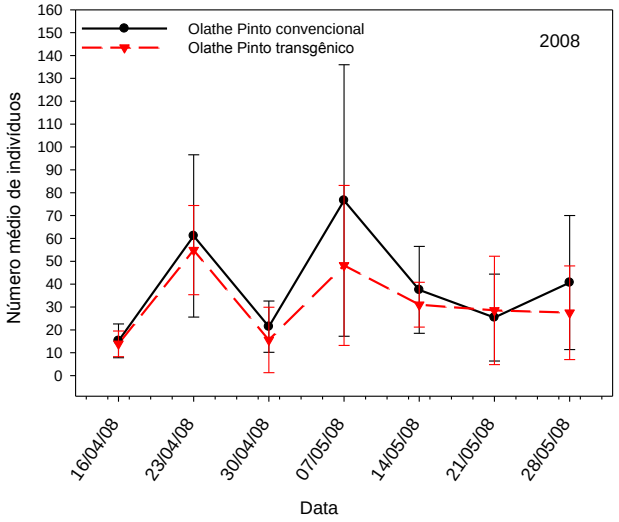
Root colonization by indigenous NF mycorrhiza

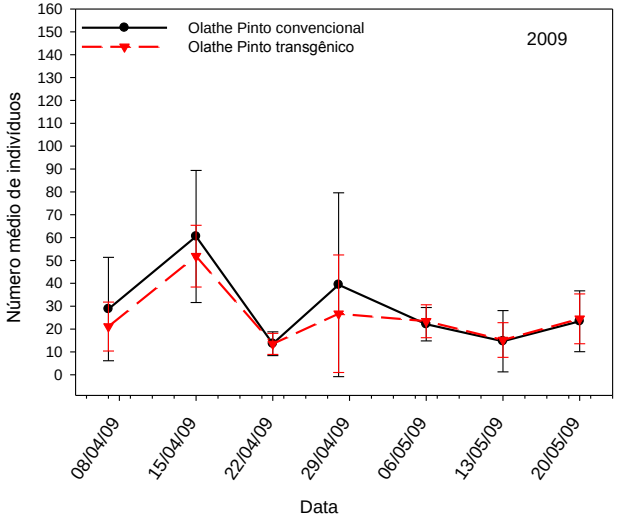


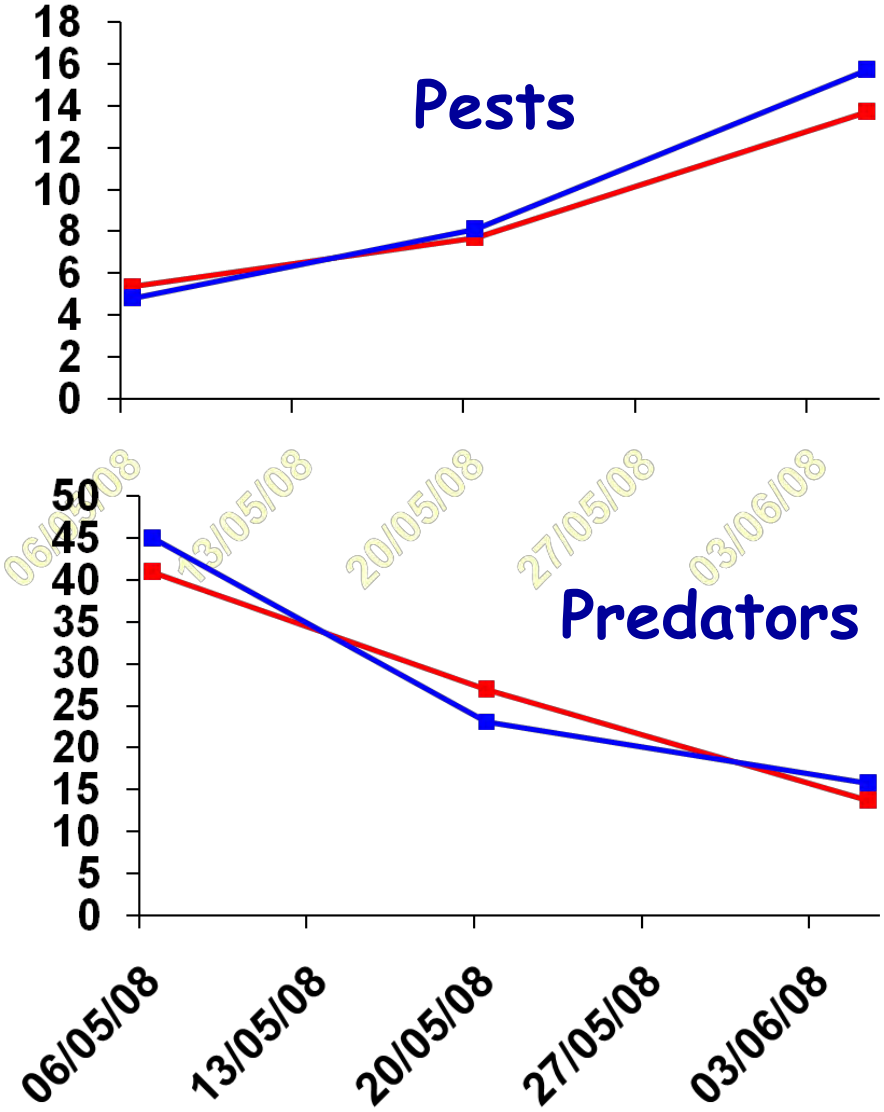
Populations of NFM in roots



Fluctuation of arthropod populations






Pests
18
16
14
12
10
8
6
4
2
0
Predators
50
45
40
35
30
25
20
15
10
5
0
06/05/08
13/05/08
20/05/08
27/05/08
03/06/08


FT
FC

Agronomic characterization: Production, germination, early seedling height, maximum width of the primary leaves, maximum length of the primary leaves, number of seeds per pod, weight of 100 seeds, pod length, pod width, seed length, seed width, thickness of seeds, flowering

Table 1 Agronomic traits in bean transgenic line 5.1 cultivated in the field during low-disease-incidence season in three regions of Brazil

Trait	Goiás[a]		Minas Gerais[a]		Paraná[a]	
	Control	Transgenic	Control	Transgenic	Control	Transgenic
Yield (kg/ha)	770.8	628.1	2,460	2,476	2,268	2,344
Seed germination (%)	86.9	91.4	87.9	85.4	75.2	86.2
Initial plant height (cm)	10.4	10.2	13.6	13.5	9.9	9.7
Width of the leaves (cm)	6.8	6.7	7.4	7.3	6.4	6.3
100-seed weight (g)	27.3	29.7	31.0	32.1	31.4	32.7
Flowering time (days after germination)	31	31	32	32	30	30
Seeds per pod	5.8	5.7	5.3	5.4	5.6	5.7

*Statistical analyses revealed no significant differences ($P < 0.05$; Tukey studentized range test, $n = 8$) between transgenic and control lines. [AU: * not found in table; [a] not explained in legend. Does the * refer to the [a] instead? If the P value applies to all data in the table, it is not necessary to include a footnote on all columns — just state in legend.]

Aragão & Faria, Nature Biotechnology, 27:1086-1088 (2009)

Embrapa

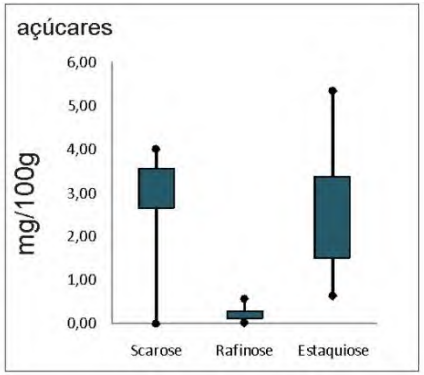
Composition equivalence, Nutritional equivalence

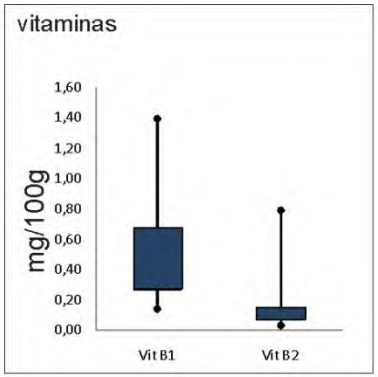
- Grain samples from multi-location, multi-year, replicated field trials
- Secondary metabolites
- Pilot scale processing, nutrient / antinutrient analysis (validated methods)
- Confirmation of food/feed safety
- Animal feeding studies

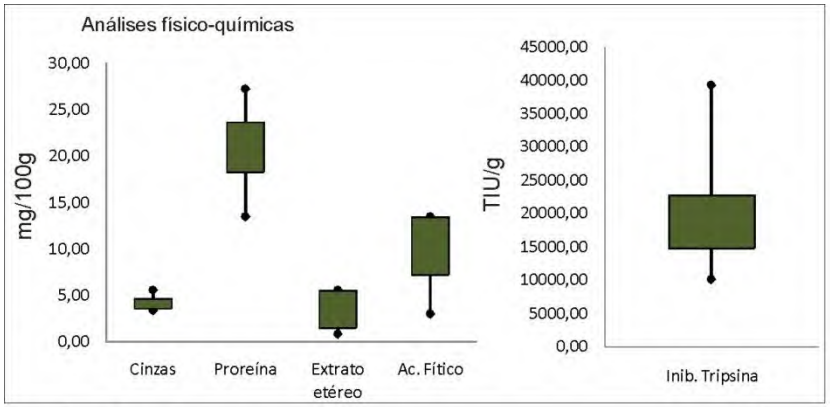
Embrapa

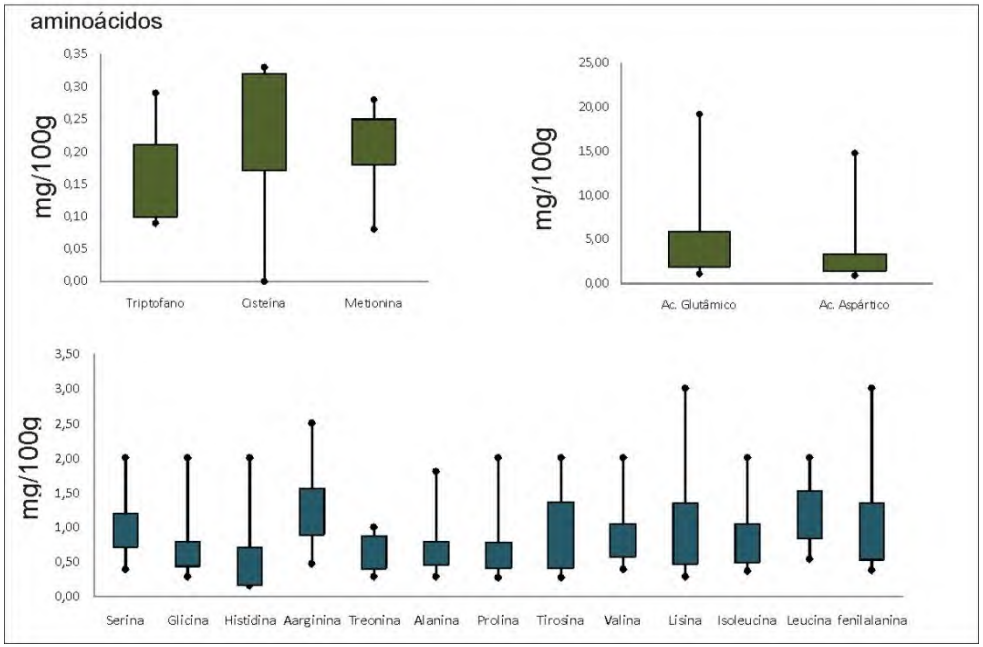
Sugars: Sucrose, raffinose, Stachyose
Vitamins: Vitamin B1, Vitamin B2
Amino acids: Tryptophan, Cysteine, Methionine, Glutamic Acid, Serina, Glycine, Histidine, Arginine, Threonine, Alanine, Proline, Tyrosine, Valine, Lysine, Isoleucine, Leucine, Phenylalanine.
Physic-Chemical Analyses: Moisture, ash, protein, phytic acid, trypsin inhibitor, etc
Minerals: Aluminum, Calcium, Lead, Cobalt, Copper, Chromium, Iron, Phosphorus, Magnesium, Molybdenum, Potassium, Selenium, Sodium, Zinc
Sensorial Analyses

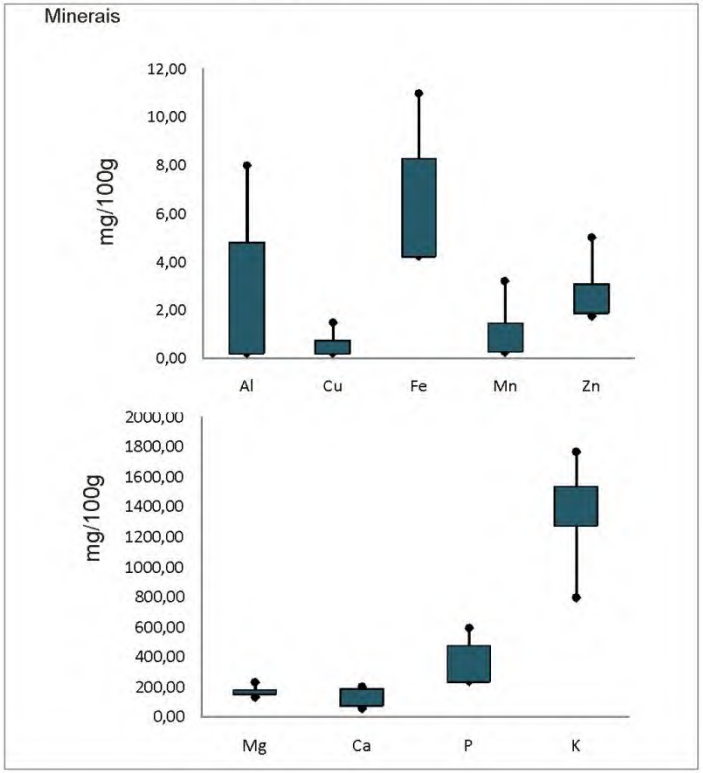
Embrapa


açúcares
mg/100g
6,00
5,00
4,00
3,00
2,00
1,00
0,00
Scarose
Rafinose
Estaquiose


vitaminas
mg/100g
1,60
1,40
1,20
1,00
0,80
0,60
0,40
0,20
0,00
Vit B1
Vit B2


Análises físico-químicas
mg/100g
30,00
25,00
20,00
15,00
10,00
5,00
0,00
Cinzas
Proreína
Extrato etéreo
Ac. Fítico
TIU/g
45000,00
40000,00
35000,00
30000,00
25000,00
20000,00
15000,00
10000,00
5000,00
0,00
Inib. Tripsina


aminoácidos
mg/100g
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
Triptofano
Osteína
Metionina
mg/100g
25,00
20,00
15,00
10,00
5,00
0,00
Ac. Glutâmico
Ac. Aspártico
mg/100g
3,50
3,00
2,50
2,00
1,50
1,00
0,50
0,00
Serina
Glicina
Histidina
Aarginina
Treonina
Alanina
Prolina
Tirosina
Valina
Lisina
Isoleucina
Leucina
fenilalanina


Minerais
mg/100g
12,00
10,00
8,00
6,00
4,00
2,00
0,00
Al
Cu
Fe
Mn
Zn
mg/100g
2000,00
1800,00
1600,00
1400,00
1200,00
1000,00
800,00
600,00
400,00
200,00
0,00
Mg
Ca
P
K

- Growth
- food consumption
- histomorphological studies
- biochemical analyses

Rattus norvegicus

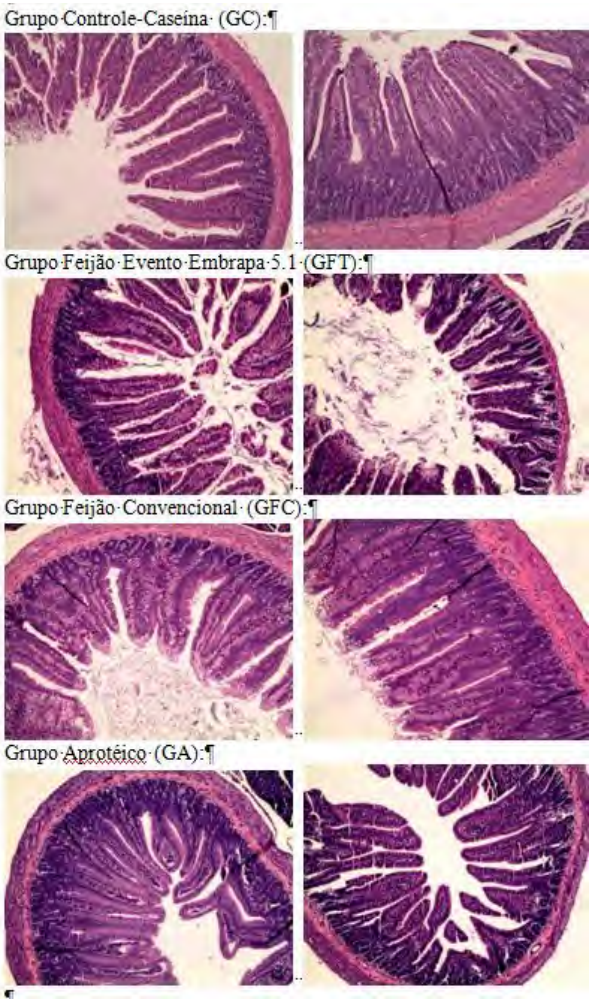
siRNA and cooked grains

Experimental Protocol (67/08-CEEA-UNESP)

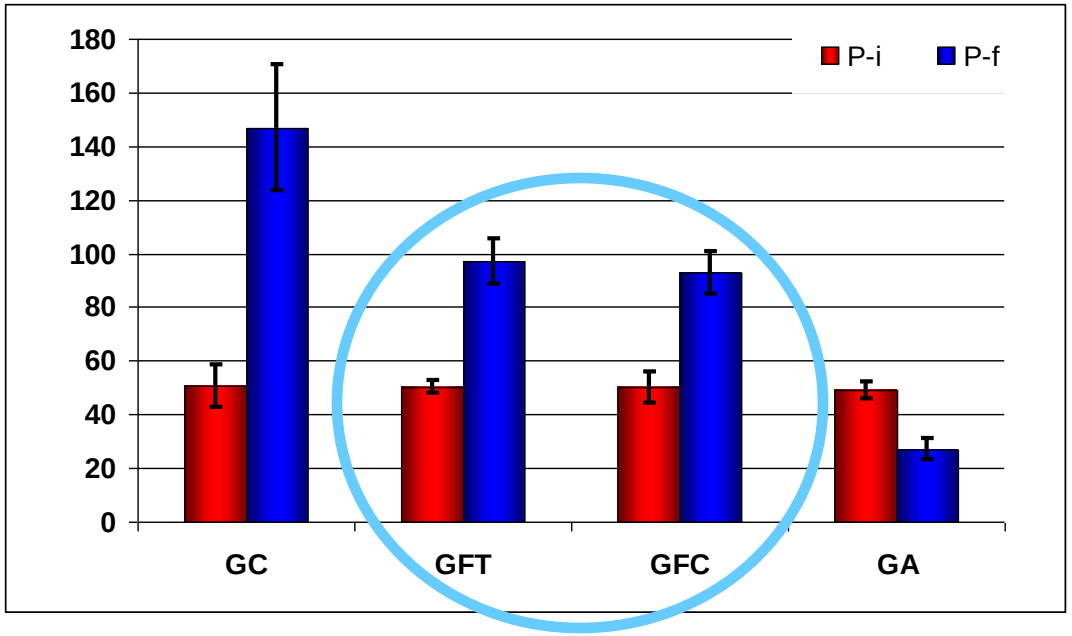
Embrapa

Rattus norvegicus

Embrapa



Stomach, intestine, duodenum, jejunum, uterus, hepatocytes, liver, kidneys, heart, thymus, ovaries, testicle and femur



Biochemical analyzes (two generations)

renal dysfunction
injury to the liver
hepatic dysfunction

Embrapa

Embrapa Arroz e Feijão
Josias Corrêa de Faria
Eliane Dias Quintela
José Francisco Arruda e Silva
Edmar Cardoso de Moura
Vanderlino Moreira de Santana
Jaison Pereira de Oliveira
Murillo Lobo Junior
Paula Arielle Mendes Ribeiro Valdisser
Maria José Del Peloso

Embrapa Agrobiologia
Bruno José Rodrigues Alves
Gustavo Ribeiro Xavier
Segundo Sacramento Urquiaga Caballero
Altiberto Moreira Baeta;
Roberto Gregio de Souza;
Maria Elisabeth Fernandes Correia
Norma Gouvea Rumjane
Roberto Silva de Oliveira
Itamar Garcia Ignácio
Orivaldo José Saggin Junior
João Luiz Bastos

Embrapa Milho e Sorgo
José Aloisio Alves Moreira

Embrapa Soja
Geraldo Estevam de Souza Carneiro

Universidade Estadual Paulista
Norka Beatriz Barrueto González
Renata M. Galvão Campos Cintra
Luis Fernando Barbisan
Alaor Aparecido de Almeida

Universidade Federal do Ceará
Francisco de Assis de Paiva Campos

Embrapa Recursos Genéticos e Biotecnologia
Francisco José Lima Aragão
Elsa Oliveira Paranaguá e Lago Nogueira
Kenny Bonfim
Maria Laine Penha Tinoco
Antonieta Nassif Salomão
Solange Carvalho Barrios Roveri José
Marcelo Porto Bemquerer
Beatriz Simas Magalhães
Vera Lucia Perussi Polez

Embrapa Agroindústria de Alimentos
José Luiz Viana de Carvalho
Marília Regini Nutti
Edson Watanabe
Edna Maria Morais Oliveira
Ronoel Luiz de Oliveira Godoy
Sidinea Cordeiro de Freitas
Sidney Pacheco
Luzimar da Silva de Mattos
Jeane Santos Rosa de Mello
Manuela Cristina Pessanha de Araujo
Adriana Paula da Silva Minguita
Carmine Conte
Epaminondas Silva Simas
Juliana de Oliveira Santos
Tania dos Santos Silva
Jose Manoel de Oliveira
Paulo Sergio de Souza
Tatiane Correa de Oliveira

Universidade de Brasília
Élida Geralda Campos
Anna Paula Costa Jesuino
Érica Heringer Machado
Viviane Yllena Vieira de Souza

Universidade Estadual de Campinas
Jaime Amaya-Farfan

65 (89) members
10 Research centers

FEIJAOSEG

Embrapa

Ciência, Tecnologia e Inovação
Ministério da Ciência, Tecnologia e Inovação

GOVERNO FEDERAL BRASIL PAÍS RICO É PAÍS SEM POBREZA

Comissão Técnica Nacional de Biossegurança

CTNBio

BUSCA:

MENU

- CTNBio
- CIBio
- Gestão Administrativa
- Legislações
- Legislation
- Documentos
- Aprovações Comerciais
- Commercial Aprovals
- Eventos
- Outros Links
- Orgãos de Fiscalização
- Fale Conosco
- Audiência Pública - Feijão
- Requerimento de Cópias e Pedido de Vistas
- Oficio nº 786/11 do Presidente da CTNBio encaminhado ao Ministro de Estado da Ciência e Tecnologia

NOTICIAS

18/05/2012 00:29:00
CTNBio aprova duas liberações comerciais

19/04/2012 20:18:00
CTNBio realiza primeira reunião sob a nova presidência

23/03/2012 16:46:00
Flavio Finardi é o novo presidente da CTNBio

15/03/2012 15:10:00
CTNBio indica nomes para assumir presidência da comissão

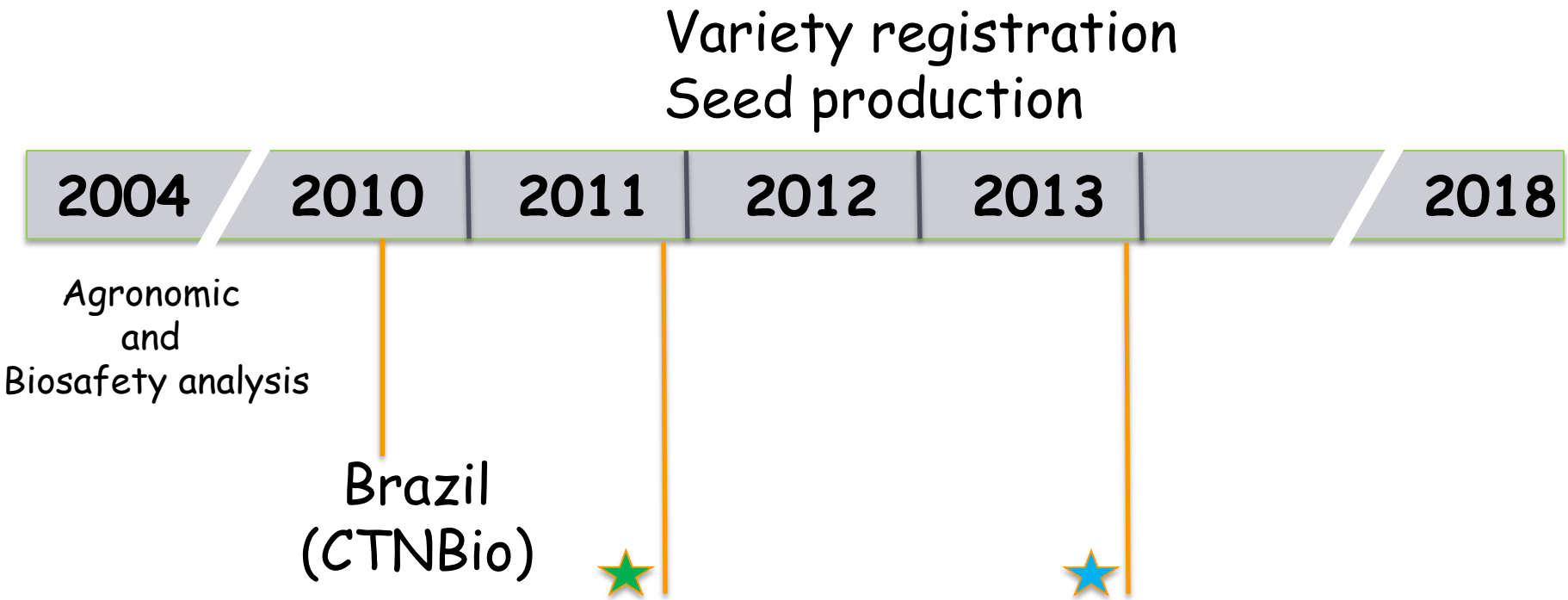
Veja aqui a PAUTA DA 152ª REUNIÃO ORDINÁRIA, de 17 de maio de 2012

Veja aqui as DELIBERAÇÕES DA 152ª REUNIÃO ORDINÁRIA, de 17 de maio de 2012

A CTNBio é uma instância colegiada multidisciplinar, criada através da lei nº 11.105, de 24 de março de 2005, cuja finalidade é prestar apoio técnico consultivo e assessoramento ao Governo Federal na formulação, atualização e implementação da Política Nacional de Biossegurança relativa a OGM, bem como no estabelecimento de normas técnicas de segurança e pareceres técnicos referentes à proteção da saúde humana, dos organismos vivos e do meio ambiente, para atividades que envolvam a construção, experimentação, cultivo, manipulação, transporte, comercialização, consumo, armazenamento, liberação e descarte de OGM e derivados.

Embrapa

Quo vadis GM bean?


Variety registration
Seed production
2004
2010
2011
2012
2013
2018
Agronomic
and
Biosafety analysis
Brazil
(CTNBio)
Post commercial evaluations
(5 years ?)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Thank you

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Conselho Nacional de Desenvolvimento Científico e Tecnológico

FINEP

Embrapa

Ministério da Agricultura, Pecuária e Abastecimento

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