Standards for Germplasm Collecting and Acquisition

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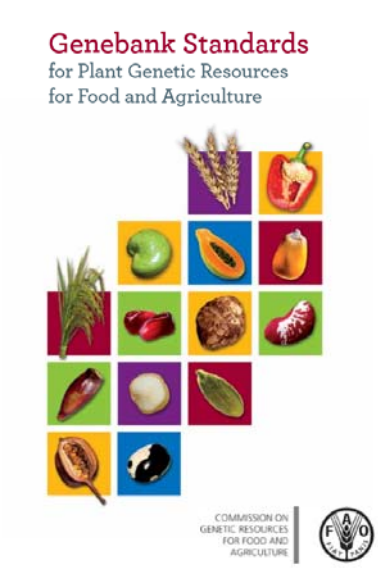

FAO. 2013. Genebank Standards for Plant Genetic Resources for Food and Agriculture. Rome.

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Germplasm Acquisition

Acquisition is the first step in conservation of Plant Genetic Resources (PGR). It is a process of collecting or requesting seeds for inclusion in the genebank, together with related information.

The material should be legally acquired, be of high seed quality and properly documented.

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Standards for Acquisition

4.1.1 All seed samples added to the genebank collection have been acquired legally with relevant technical documentation.

Acquisition is made in accordance with relevant international and national regulations such as phytosanitary/quarantine laws, ITPGRFA or CBD access regulations, and national laws for genetic resources access.
Adherence to this standard will allow the export of seeds from the origin/donor country and the import into the country of the genebank, and determine the management and distribution regime (e.g. SMTA or Material Transfer Agreements [MTA]).

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4.1.2 Seed collecting should be made as close as possible to the time of maturation and prior to natural seed dispersal, avoiding potential genetic contamination, to ensure maximum seed quality.

There is a need to ensure maximum seed quality and avoid conservation of immature seeds and seeds that have been exposed for too long to the elements. The way that seeds are handled after collection and before they are transferred to controlled conditions is critical for seed quality. Unfavorable extreme temperatures and humidity during the post-collecting period and during transport to the genebank could cause rapid loss in viability and reduce longevity during storage. The same applies to post-harvest handling within the genebank.

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4.1.3 To maximize seed quality, the period between seed collecting and transfer to a controlled drying environment should be within 3 to 5 days or as short as possible, bearing in mind that seeds should not be exposed to high temperatures and intense light and that some species may have immature seeds that require time after harvest to achieve embryo maturation.

The seed quality and longevity is affected by the conditions experienced prior to storage within the genebank. It is recommended that a germination test be conducted immediately after processing and before pre-storage as a way to determine the quality of the seed collected.

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4.1.4 All seed samples should be accompanied by at least a minimum of associated data as detailed in the FAO/bioversity multi-crop passport descriptors.

During the acquisition phase, it is important to ensure that passport data for each accession is as complete as possible and fully documented, especially georeferenced data that can help to locate collection sites. Passport data are crucial in identifying and classifying the accession and will function as entry points in selecting and using the accession.

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4.1.5 The minimum number of plants from which seeds should be collected is between 30-60 plants, depending on the breeding system of the target species.

Attempt to collect equal numbers of seeds from each plant sampled at the time of natural dispersal. Do not collect from the ground, unless only recently dispersed. Avoid damaged seeds (mechanical damage; pest attack).

Plan your activities so that no more than one month elapses between collecting and reception by the genebank.

If it is possible to avoid quarantine seed treatments without breaking quarantine regulations (i.e. post-entry quarantine), do so.

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Access to PGR - Development of Convention on Biological Diversity (CBD)

- **Outcome from Earth Summit in June 1992 in Rio de Janeiro**; entered into force on 29 December 1993
- **Change of PGR paradigm**: From common heritage for humankind to national sovereignty
- **Objectives of CBD**
  - Conservation of genetic resources
  - Sustainable use of genetic resources
  - Access and sharing of benefits arising from genetic resources

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The International Treaty on PGRFA

- In force since 2004 to facilitate access to PGR for F&A and benefit sharing (Multi-lateral System = MLS)
- MLS is a global pool of genetic resources comprising 64 crops (80% of food derived from plants)
- SMTA adopted at 1st Session of Governing Body in Madrid (June 2006)
- SMTA is a standard contract that regulates ABS in exchanges of PGRFA
- Global Online ordering system (GENESYS) with automated SMTA use
- Benefit-sharing fund of 10 million USD envisioned for conservation projects in developing countries
- Treaty currently has 135 contracting parties

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Scope and impact of SMTA / MLS

Only a few vegetable species belong to ANNEX I of the treaty/MLS:

Brassica complex, carrot, eggplant, beans, peas, asparagus,
but many genebanks (Europe) use SMTA for all (vegetable) crops

Advantages:

- Conditions and terms for ABS are standardized
- Practical, transparent, non discriminatory
- Legal certainty for both provider and user

Concern:

Funds contributed only by countries (Australia, Canada, Indonesia, Ireland, Italy, Norway, Spain, Switzerland), not through benefit-sharing mechanism

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Crops under Multilateral System (MLS) held by AVRDC

Crop	Genus	# accessions
Asparagus	*Asparagus*	5
Beet	*Beta*	18
Brassica Complex	*Brassica* et al.	1,909
Pigeon Pea	*Cajanus*	134
Chick Pea	*Cicer*	25
Major Aroids	*Colocasia*	1
Carrot	*Daucus*	20
Yams	*Dioscorea*	4
Sunflower	*Helianthus*	5
Lentil	*Lens*	28
Sweet Potato	*Ipomoea*	0
Grass Pea	*Lathyrus*	4
Beans	*Phaseolus*	636
Pea	*Pisum*	226
Potato	Solanum	0
Eggplant	*Solanum*	3,702
Faba Bean	*Vicia*	8
Cowpea et. al.	*Vigna*	12,130
Maize	*Zea*	73
Total		18,928 (61,308)

Total # accessions under MLS: 18,928 or 30.9% of entire AVRDC collection (61,435)

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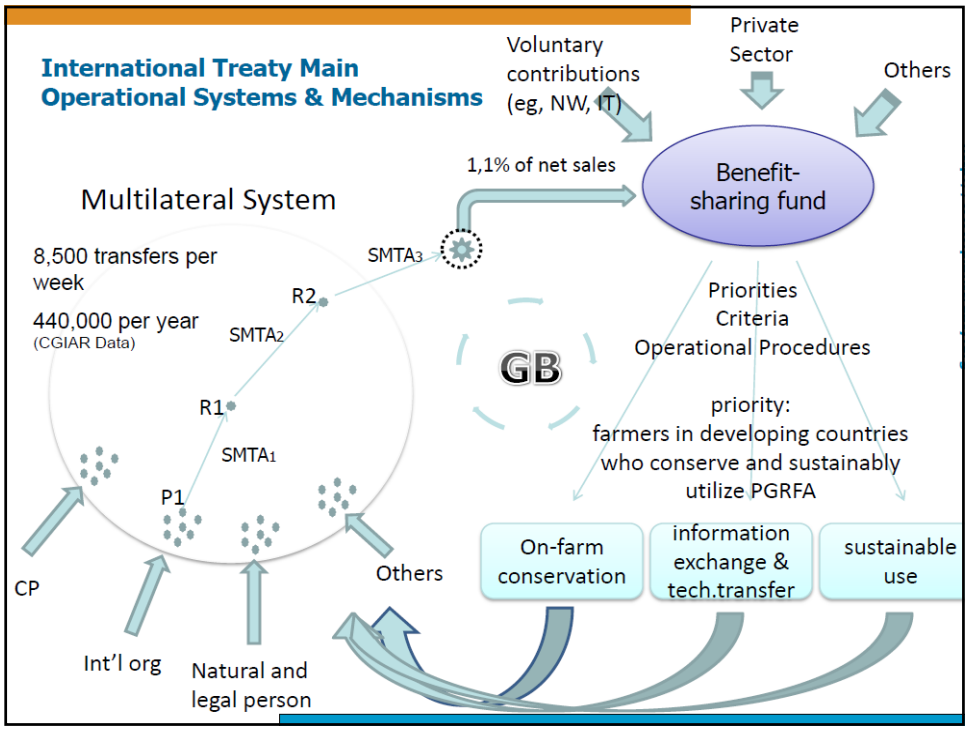
Non-MLS crops maintained by AVRDC

Principal Crop	Genus	# accessions
Soybean	*Glycine*	15,321
Pepper	*Capsicum*	8,165
Tomato	*Solanum*	8,136
Leek, garlic, onion, shallot	*Allium*	1,129
Okra	*Abelmoschus*	918
Loofah	*Luffa*	870
Pumpkin, squash	*Cucurbita*	858
Amaranth	*Amaranthus*	769
Cucumber, melon	*Cucumis*	645
Bitter gourd	*Momordica*	460
Hyacinth bean	*Lablab*	438
Roselle	*Hibiscus*	367
Others		3,458
Total		41,534



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Trade-related Intellectual Property Rights – TRIPS

- 1948 – 1994 General Agreement on Tariffs and Trade (GATT) – provisional for almost half a century
- Creation of WTO – 1 January 1995
  - Industrialized nations established protection of IPR as key principle of world trade (TRIPS)
  Patents are understood as a contract between an inventor and society;
  Patents protect discoveries in all fields of business and technology, even in the fields of medicine, agriculture and food;
  Patents provide limited monopoly on the use of an innovation, assuming that it serves society;
  The state must protect IPR of inventors.

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TRIPS and UPOV Convention

- All WTO members are bound by TRIPS
- TRIPS also accepts other *sui generis* forms of IPR protection for plant varieties
- The European seed industry created a *sui generis* system to protect plant varieties under the Convention of the Intern. Union for the Protection of New Varieties of Plants (**UPOV**); also applied outside Europe
- UPOV Convention adopted in Paris in 1961; revised 1972, 1978, 1991
- - New varieties must be novel (not previously marketed)
  - Distinct from other available varieties
  - Uniformity / homogeneity
  - Traits must be stable (true to type)
  -

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UPOV Convention 1991

- UPOV provides for 'breeders exemption'; all breeders may use protected varieties for further breeding
- 1991 version of UPOV recognizes 'farmers' privilege': use of own harvested material of protected varieties as seed for next season planting;
  - this is not an international legal standard; member states have to define and implement the farmers' privilege in national law, taking into account the 'legitimate rights' of breeders. Many countries allow only small farmers to use part of their harvest as seed.
- Rigid enforcement of IPR in the area of agriculture and food markets can trigger conflicts, both in developed and developing countries.

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Patent applications are progressing

- World International Property Organization (WIPO) established as UN organization in 1967, HQ in Geneva, Switzerland
- WIPO registered 1.979 million international patent applications by 2010; 44,810 entries related to plants
- The global commercial seed market is characterized by intense competition based on product performance, continuous R&D, introduction of new traits and IPR protection

  Progressive use of patents is leading to continuous market concentration and increase in seed prices all over the world (Global Seeds Market Report, 2011 edition)

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Patents on PGR – a source of conflict

Breeding companies invest 15-25% of turnover in R&D;

Patents and *sui generis* systems (UPOV) help recoup investments

Varieties containing patented traits are not freely available for further breeding;

Patent holder has exclusive claim to genetic material; he can protect genetic building blocks from use by others, even if found naturally in third party material.

Mutual interest of patent holder and society? – Hardly, as stimulation of innovation is blocked!

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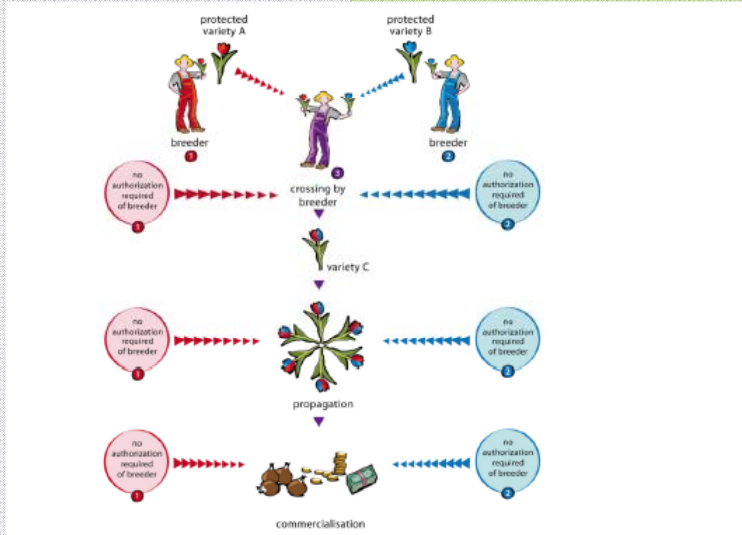
The Breeders' exemption



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Plantum NL* position on patents and PBRs (05/2009)

Biological material protected by patents should be freely available for further breeding

The use and exploitation of these new varieties should be free, in line with the breeders' exemption (UPOV)

The mentioned free availability, use and exploitation should not be allowed to be obstructed in any way, by patent rights.

*Dutch association for breeding, tissue culture, production and trade of seeds & young plants

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Permitted activities under patent law

Policy / Directive	Production/ reproduction of patented variety	Scientific research with patented variety	Crossing and selection with patented variety	Commercial exploitation of new variety, still under scope of patent
Biotech Directive 98/44/EC	NO	No specific provision	No specific provision	NO
Patents Act	NO	YES	NO	NO
Patent law (France, Germany)	NO	YES	YES	NO
Plantum proposal	NO	YES	YES	YES

Most patents interfering with breeders' exemption are held by plant breeding (not biotech) companies;
It would be irresponsible to invest millions in a plant breeding program which may end up being abandoned, if at the end a license is not granted by patent holder.

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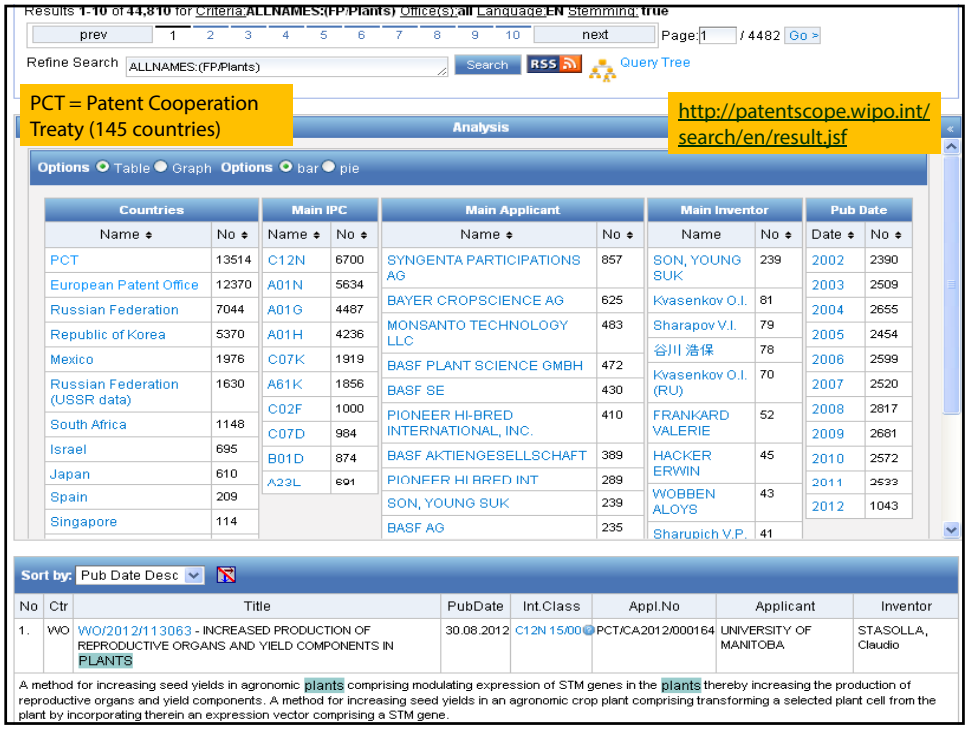
N. Louwaars: Something needs to be done about patents on plants (report to Dutch government)

For a competitive and diversified supply of new varieties and seeds, the patent system needs to be changed:

1. Breeding and plant biotechnology sectors need to **reduce strategic patenting** (blocking patents, overly broad claims and reach-through claims)
2. **Improve patent quality**: urging patent offices to implement their rules more strictly: novelty; inventive step/non-obviousness; industrial application; enabling description
3. **Introduce breeders's exemption in patent law** (requires international cooperation as industry is operating worldwide); IP policies should take into account competition policies, public research policies and development policies.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A61K 1856
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C07D 984
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BASF PLANT SCIENCE GMBH 472
BASF SE 430
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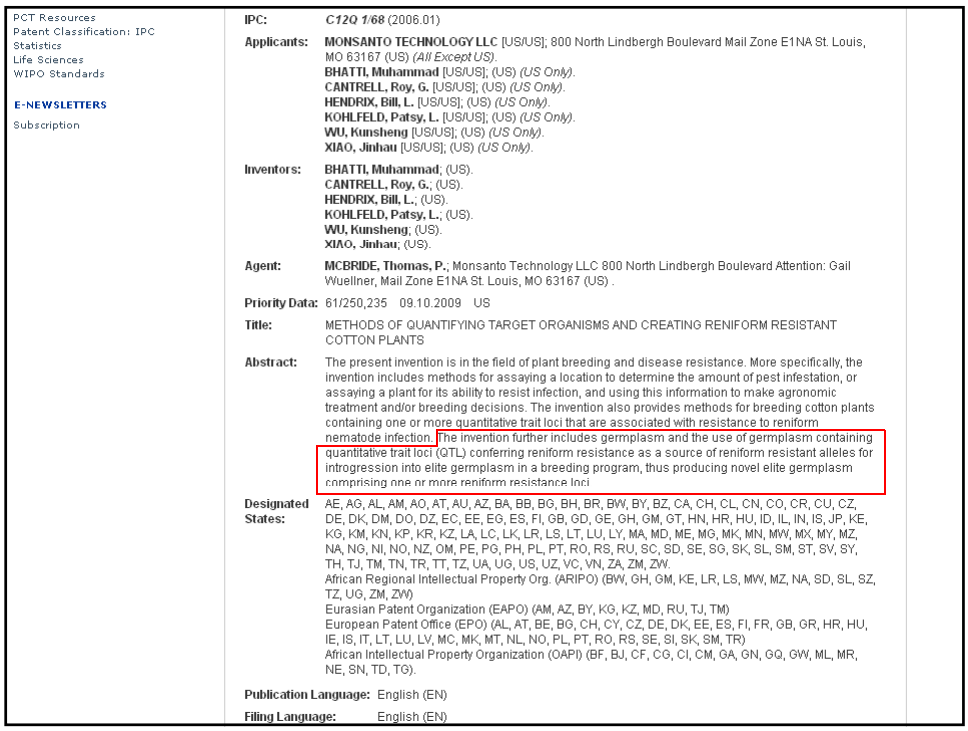
2007 2520
2008 2817
2009 2681
2010 2572
2012 1043
Sort by: Pub Date Desc
No Ctr Title PubDate Int.Class Appl.No Applicant Inventor
1. WO WO/2012/113063 - INCREASED PRODUCTION OF REPRODUCTIVE ORGANS AND YIELD COMPONENTS IN PLANTS 30.08.2012 C12N 15/00 PCT/CA2012/000164 UNIVERSITY OF MANITOBA STASOLLA, Claudio
A method for increasing seed yields in agronomic plants comprising modulating expression of STM genes in the plants thereby increasing the production of reproductive organs and yield components. A method for increasing seed yields in an agronomic crop plant comprising transforming a selected plant cell from the plant by incorporating therein an expression vector comprising a STM gene.


PCT Resources
Patent Classification: IPC
Statistics
Life Sciences
WIPO Standards
E-NEWSLETTERS
Subscription
IPC: C12Q 1/68 (2006.01)
Applicants: MONSANTO TECHNOLOGY LLC [US/US]; 800 North Lindbergh Boulevard Mail Zone E1NA St. Louis, MO 63167 (US) (All Except US).
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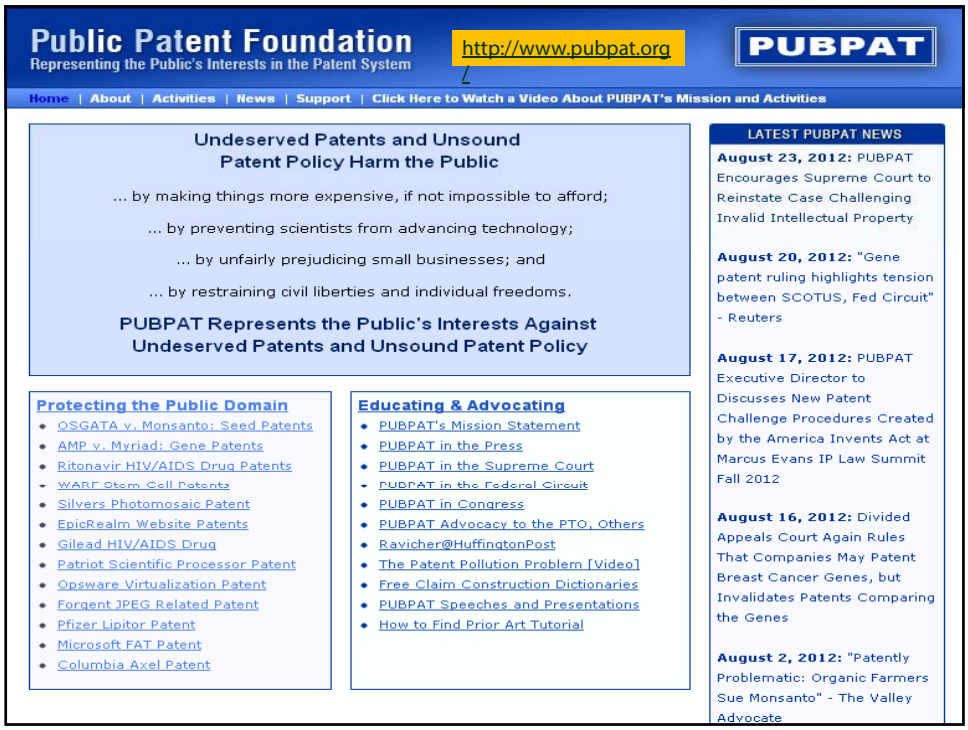
XIAO, Jinhau; (US).
Agent: MCBRIDE, Thomas, P.; Monsanto Technology LLC 800 North Lindbergh Boulevard Attention: Gail Wuellner, Mail Zone E1NA St. Louis, MO 63167 (US) .
Priority Data: 61/250,235 09.10.2009 US
Title: METHODS OF QUANTIFYING TARGET ORGANISMS AND CREATING RENIFORM RESISTANT COTTON PLANTS
Abstract: The present invention is in the field of plant breeding and disease resistance. More specifically, the invention includes methods for assaying a location to determine the amount of pest infestation, or assaying a plant for its ability to resist infection, and using this information to make agronomic treatment and/or breeding decisions. The invention also provides methods for breeding cotton plants containing one or more quantitative trait loci that are associated with resistance to reniform nematode infection. The invention further includes germplasm and the use of germplasm containing quantitative trait loci (QTL) conferring reniform resistance as a source of reniform resistant alleles for introgression into elite germplasm in a breeding program, thus producing novel elite germplasm comprising one or more reniform resistance loci
Designated States: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
African Regional Intellectual Property Org. (ARIPO) (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW)
Eurasian Patent Organization (EAPO) (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM)
European Patent Office (EPO) (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR)
African Intellectual Property Organization (OAPI) (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
Publication Language: English (EN)
Filing Language: English (EN)



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Further breeding should not be blocked by patents!

- The proliferation of patents on germplasm and genetic building blocks (natural traits) will have serious consequences for the plant breeding sector as not all companies will be able to obtain licenses for important traits and maintain their competitive edge (major concentration and consolidation of sector)
- Cost of seed and planting material will substantially increase as costs for licenses will be passed on to the growers, and finally the consumers
- Growers will have limited choice of varieties for a specific crop
- Patents will slow down the level of innovation in general across the plant breeding sector.

Material Transfer Agreements

- August 1, 2013:
AVRDC adopts the use of the SMTA for the distribution of all of its genebank accessions and is now in line with the procedure in use by the CGIAR Centers (IRRI, CIMMYT, ICARDA, ICRISAT, IITA, CIAT, ILRI, Bioversity International, CIP and AIRCA Centers (CATIE) possessing active genebanks in accordance with the ITPGRFA.

AVRDC-developed breeding lines continue to be distributed under AVRDC's MTA2.

Access to germplasm in genebanks should not be blocked by patents!

- AVRDC would like to uphold an important clause in its MTA which says:
"The **Recipient** shall not claim any intellectual property or other rights that limit the access to and use of the **Material** provided under this Agreement, or its genetic parts or components, in the form received from **AVRDC**".
- If patents applied on traits identified in germplasm held by AVRDC would indeed limit the use and distribution of the original material, we could no longer supply germplasm for breeding efforts.
- Some interpretations of the patent law go so far as to infer that traits identified in other lines and patented might block the use of any germplasm if accessions happen to contain the same natural traits.

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Nagoya Protocol

- **Nagoya Protocol (NP) on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits arising from their Utilization – Treaty against Biopiracy** adopted during COP 10 meeting in Nagoya, Japan (29 October 2010; will enter into force on 12 Oct. 2015; ratified by 53 countries)
- **International regime on ABS**
  - intended to prevent misappropriation of genetic resources
  - based on prior informed consent and mutually agreed terms
- - it makes it mandatory to grant the share of benefits to local people during commercial utilization of any genetic material.
  - how to be harmonized with ABS under International Treaty?