



RAFI COMMUNIQUE

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Pharmaceutical Companies Bid for Northern Botanical Garden Collections in Attempt to Avoid the Biodiversity Convention

ISSUE: Botanical gardens are mega-storehouses of *ex situ* plant biodiversity, holding samples of as much as half of all vascular plant species in the world. Almost three-quarters of all the world's botanical gardens are in the North. In their quest to discover new sources of plant-derived drugs, pharmaceutical corporations and biotech firms are now approaching botanical gardens to buy samples of tropical plant diversity. Buying plant germplasm held in Northern botanical gardens may be easier and more convenient than negotiating access with countries of origin in the South, but it is a giant loophole and clear violation of the spirit--if not the law--of the Convention on Biological Diversity (CBD).

PARTICIPANTS: Pharmaceutical corporations making a bid for Northern botanical garden germplasm include GlaxoWellcome, Merck, Pfizer, Phytera, and Shaman. Botanical garden directors confirm several more companies are seeking access, though details are not available. SmithKline Beecham is using the expertise of a Northern botanical garden to grow an important Chinese drug-producing plant in the U.S. and avoid sourcing the plant in Asia. Intermediaries like the New York Botanical Garden have collected plants from other Northern botanical gardens to provide to corporations and the U.S. National Cancer Institute. The rights of indigenous peoples and farmers are being bypassed by corporate deals with botanical gardens. But the member nations of the CBD - who committed themselves to resolve the outstanding problem of *ex situ* collections gathered before the coming into force of the convention - have yet to act.

POLICY IMPLICATIONS: Commercial sale of tropical plant biodiversity held in Northern botanical gardens is a dangerous loophole that undermines the Biodiversity Convention and makes a mockery of the CBD's fundamental principles: provisions for national sovereignty over germplasm, and the fair and equitable sharing of benefits arising from utilization of genetic resources. All *ex situ* germplasm collections found outside the country of origin that were acquired before the CBD entered into force are currently exempt from the CBD's scope. Plant samples collected after 1992, however, are subject to provisions of the CBD. The CBD must act, and the loophole must be closed.

Introduction

In this *Communique* RAFI investigates current attempts by the pharmaceutical industry to gain access to and purchase tropical plant samples from botanical garden collections in the North. Taking advantage of a major loophole in the Convention on Biological Diversity's (CBD) provisions to protect biodiversity, pharmaceutical companies are seeking to avoid negotiating with Southern governments for access to plant genetic resources by obtaining them on more convenient terms from botanical gardens.

A recent study by the International Association of Botanical Gardens (IABG) indicates that worldwide botanical garden collections (about 3/4 of which are in the North) have at least one sample of as much as half of the world's vascular plants.

From the U.S. Pacific island state of Hawaii to Eastern Europe, botanical garden directors are being asked by pharmaceutical corporations for rights to chemically analyze their collections to develop new drugs. The companies propose to pay for the opportunity to screen the gardens' vast diversity; but who should determine what is the appropriate manner and means of compensation?

Botanical Gardens: A Geopolitical Overview¹

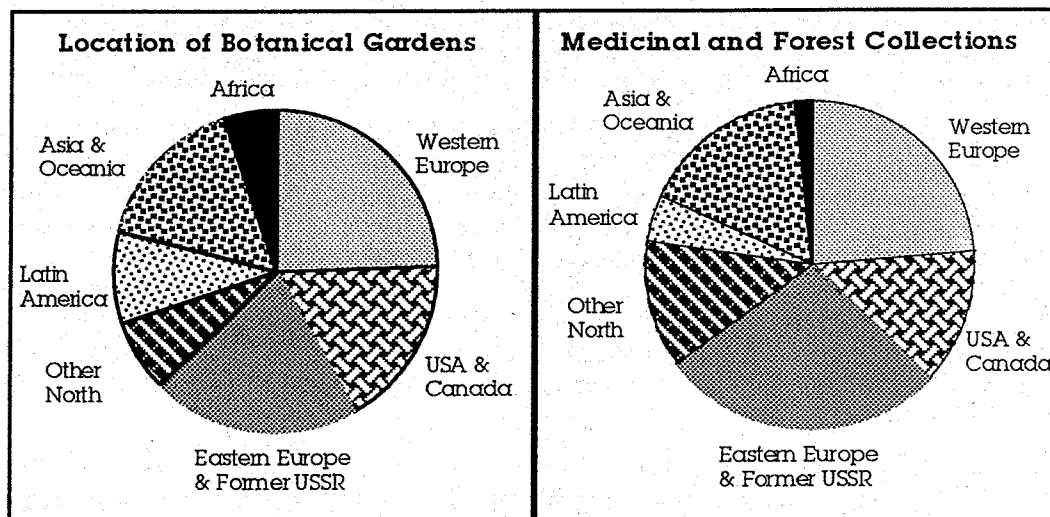
The most recent estimate is that there are about 1,500 botanical gardens in the world. These gardens hold samples of about half of the world's vascular plant varieties. A large majority of gardens' accessions and taxa (i.e. genera and species) are found in the North (including Eastern Europe and the former USSR). While all botanical gardens are germplasm repositories, about half of botanical gardens are active in the conservation of plant germplasm through the deliberate accumulation and reproduction of collections of particular genera, species, or other agglomerations of taxa useful for particular purposes (e.g. "Chinese herbs" or "Flora of La Selva, Costa Rica").

North and South: How the Basic Numbers Stack Up

	North, incl. Eastern Europe	South
Number of Gardens:	70%	30%
Number of Accessions:	72%	28%
Number of Taxa Represented:	86%	14%
Particular Germplasm Collections:	80%	20%

Many botanical gardens, including very large and influential ones like the Royal Botanical Garden at Kew (U.K.), the Missouri Botanical Garden (U.S.), and the New York Botanical Garden (U.S.), conduct extensive international plant collecting expeditions. But according to a study by J.E. Hernandez Bermejo, Secretary General of the International Association of Botanical Gardens (IABG), most accessions are not directly obtained from nature by plant collectors. Instead, botanical gardens usually depend upon exchanging germplasm between themselves (25% of holdings) and buying plants from private or public sources (50% of holdings).

While careful conduct of plant collecting expeditions yields precise and accurate information regarding the geographic origin of collected germplasm, this is not true for the acquisition of specimens by exchange and direct purchase of plants from commercial sources. Thus adequate information does not exist to reliably document the origin of important holdings in many botanical gardens. As botanical gardens continue to freely exchange germplasm among themselves, this problem is compounded as specimens make their way around the world with only sparse documentation.



According to the Hernandez Bermejo study, 120 botanical gardens maintain known collections of crop species (food, fiber, oils, and industrially useful taxa) while 170 have known medicinal and forest species collections. An additional 800 botanical gardens (some of which are very large) do not maintain, either through design or lack of resources, sufficient documentation of their holdings to ascertain the agricultural and/or medicinal value of their germplasm.

Like other biodiversity collections, botanical gardens are subject to the provisions of the Convention on Biological Diversity (CBD). But botanical garden plants which were collected prior to the CBD's implementation in 1992 are exempt from the CBD's requirements. This includes plants which are obtained from another botanical garden which originally obtained the specimens in question prior to 1992. Benefits that accrue from use of collections made after 1992 do, however, fall under the CBD's requirements.

Botanical garden directors are seldom able to unilaterally decide who may and may not have access to their collections. As a matter of long-standing policy dating to pre-CBD times, most botanical gardens freely exchange germplasm with other researchers for non-for-profit scientific uses. But they often (but not always)² apply different criteria when large numbers of samples and/or commercial interests are involved. In the latter cases, participation in any agreement usually requires the approval of the garden's governing body. The governing structures of botanical gardens are highly varied. According to Hernandez Bermejo the breakdown is as follows:

Regional Administration:	38%	Municipal Administration:	9%	Private Organisations:	11%
Municipal/University Partnership:	9%	University/Research Groups:	31%	Other/Unknown:	10%

Botanical gardens in the North contain not only native plants, but also vast collections of plants from the South (see "Botanical Gardens: A Geopolitical Overview" opposite). The legally-binding CBD stipulates that use of botanical garden collections acquired after 1992 must comply with the CBD's requirements for benefit-sharing with the country of origin. Collections made prior to 1992, however, are currently exempt from these rules.

While Northern botanical garden directors and governing bodies are within their international legal rights to sell access to the plants from the South held in their gardens, doing so clearly violates the spirit of the CBD. The CBD has recognized this loophole since 1993; but its continued inaction on *ex situ* collections allows pharmaceutical companies and other researchers to profit from the South's biodiversity while conveniently ignoring issues of national sovereignty, benefit sharing, and access provisions of the CBD.

The pharmaceutical industry's newly rediscovered interest in botanical garden collections comes at a time when gardens the world over (especially in Eastern Europe and the former USSR) are having difficulty finding the funds to adequately maintain their collections. Thus, governments in the South and indigenous peoples, who are anxious to ensure an equitable sharing of benefits from the use of their biodiversity, find their interests threatened by Northern botanical gardens needs to find funds for their own survival.

The Botanical Chess Game

A single invention of the 1820s - the Wardian Case - made it possible for botanical gardens to transfer living plants over long distances with reasonable hopes for the plant's survival. In the decades that followed, the Berlin Botanical Garden (now the target of Phytera's interest) facilitated the transfer of sisal from the Yucatan Peninsula to East Africa. Kew Gardens was the conduit for rubber from Brazil to Malaysia and for chichona from the Andes to South Asia. Botanical gardens in Amsterdam and Paris helped move coffee - already transported from Ethiopia to Asia - from Indonesia to Guadeloupe and South America. Other gardens helped move oil palms from Africa to Southeast Asia and to transfer tea from China to India, and, later, to East Africa. In 1983, RAFI dubbed this the "botanical chess game". If some colonies lost markets as a result, it could be argued that other colonies gained. In the end, however, the real beneficiaries were the colonial powers. The chess game ground to a close following World War I and botanical gardens receded in the minds of scientists and the public.

Today, however, a new Wardian case - Phytera's proprietary plant tissue culture systems - is offering a revival for the role of botanical gardens. The system allows researchers to investigate the pharmacological potential of a plant species based upon a single plant accession (or even cell) from a single botanical garden. This makes mass sampling of botanical garden collections economically efficient. Once again, the source of the diversity could be the loser.

Chequemate?

Indeed, botanical garden directors in the North specifically cite the CBD's recognition of Southern governments, indigenous peoples, and local communities as a major reason why pharmaceutical companies are turning to botanical garden collections.

Charles Lamoureux, Director of the University of Hawaii's Lyon Arboretum, heads a 15,000 accession collection in frost-free conditions that are the envy of other U.S. botanical garden directors. Lyon Arboretum's collection includes thousands of Asian, South, and Central American tropical forest plants. Lamoureux says he has been approached recently by "three or four" pharmaceutical companies, and that: "I suspect there will be many more people knocking on our door in the near future... we may have things that it's going to be hard to get out of other countries in the world."³

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- Dr. Charles Lamoureux, Director
Lyon Arboretum, Hawaii (USA)

At least one company, US-based Phytera Pharmaceuticals (see Phytera section, p 4) concurs with that assessment. The *New Scientist*, which interviewed Phytera's vice-president John McBride in June wrote "[McBride] says Phytera has been trying to negotiate access to plants with the governments of 'five or six' developing countries. But because of difficulties reaching any agreements, the company has become 'more dependent than we would like' on acquiring plants from botanical gardens."⁴

WHAT ARE THE DEALS IN THE OFFING?

The first news of the pharmaceutical companies' new offers to botanical gardens emerged in Europe, which is home to 76% of the forest and medicinal plant collections in the world. A contract proposed by Phytera Pharmaceuticals to the Palm Garden in Frankfurt, Germany (profiled below) was leaked to NGOs. Following up on this revelation, RAFI contacted several botanical gardens in the US to determine if such deals were in the works in North America as well.

Every botanical garden which replied to requests for information confirmed that pharmaceutical researchers have recently expressed interest in their collections.

In our small sample of botanical gardens, which emphasized those with large holdings of plants from the South, every botanical garden which replied to RAFI's requests for information confirmed that pharmaceutical researchers (or their intermediaries) have recently expressed interest in their collections. Even smaller botanical gardens, like the garden at the University of California at Berkeley, reported that pharmaceutical

companies had requested samples - if only "a few" - from their collections.⁵

Pfizer: Wants Unrestricted Access to Gardens in Hawaii for a Cash Payment⁶

Pfizer Pharmaceuticals, based in Connecticut, USA, has launched several major bioprospecting initiatives to collect tropical plants in the North and South. The ninth largest pharmaceutical firm in the world, Pfizer reported revenues of over U.S. \$10 billion in 1995.

One of Pfizer's bioprospecting initiatives is a seemingly innocuous collaboration with the New York Botanical Garden (NYBG). In the deal NYBG is collecting plants in the U.S., identifying them, and sending samples to Pfizer to be fed to the company's chemical screening program. RAFI's interviews, however, confirm that while NYBG plans to collect plants *in the U.S.*, this does not mean that the plants are *native to the U.S.* In fact, many of the plants to be collected are actually U.S. botanical garden specimens of plants brought from the South.

Pfizer, through NYBG, has contacted the Botanical Gardens Association of Hawaii and proposed that the Association grant unlimited access to the Hawaiian collections. If the Association and its individual members approve the deal, NYBG botanists will be free to roam the gardens' collections on Pfizer's behalf and clip plant samples for a period of two years. In return, Pfizer (through NYBG), will make a one-time cash payment of an unknown amount to the Hawaiian gardens.

The Association includes four major botanical garden collections of tropical plants (see box at right) from throughout the world.

Phytera: Offers Gardens US \$15 per Sample and a Small Royalty to Access Tropical Plant Collections

Phytera Pharmaceuticals is a relatively small company that specializes in identifying plants and other living organisms with potential in developing new drugs. Phytera does this by obtaining as many plant samples as possible, screening them, and keeping samples in a "library" of bioactive compounds they identify. Since Phytera warehouses samples in its library, in the future the company can return to its own collections to screen them with new technology or for new, as-yet-unanticipated pharmacological uses.

According to one biotechnology industry magazine, Phytera "sees its major advantages as coming from its access to plant leads, worldwide, and its ability to provide abundant quantities of a compound even from a very small plant tissue sample."⁷ Phytera has raised over U.S. \$20 million for its work, and expanded beyond its U.S. headquarters, opening offices in the U.K. and Denmark. It claims that its library is now one of the largest collections of natural bioactive compounds in the world.

While Phytera says it is negotiating directly with several countries for access to plants, it has also solicited contracts to obtain access to the collections of dozens of botanical gardens in the North. In Hawaii, some of

What's at Stake in Hawaii?

If botanical garden directors in Hawaii sign on, then any plant in their collections would be available to Pfizer for pharmaceutical screening. Currently, it is far from clear that botanical garden directors will sign. Indeed, some of the directors have expressed doubts - on both ethical and practical grounds - that the deal will be approved.

The reason why Pfizer would like to gain access to the Hawaiian gardens is clear: They could provide cheap and easy access to tropical germplasm that is otherwise difficult to obtain.

Many of these plants are the product of indigenous knowledge and deliberate human intervention, such as *ayahuasca* (*Banisteriopsis caapi* - see *RAFI Communiqué*, Nov/Dec, 1995), an Amazonian indigenous peoples' medicinal plant which is part of the Lyon Arboretum's collection. Since learning of a U.S. plant patent issued on a variety of *ayahuasca*, Amazonian indigenous people are on guard to prevent the unauthorized exportation of the sacred plant and are unlikely to voluntarily provide it to pharmaceutical companies. But if Lyon Arboretum agrees to the deal, Pfizer will have access to *ayahuasca* without ever having consulted the indigenous people who identified and developed its pharmacological properties.

But companies' interest extends beyond known medicinals, and Pfizer's proposed agreement includes access to entire collections. Below is an example of the kinds of plants in just one of the members of the Association, the Waimea Arboretum and Botanical Garden.⁸

- 512 South and Central American taxa
- 333 *Zingiberaceae* taxa (mainly from Malaysia)
- 168 Hawaiian ethnobotanical taxa
- 133 Tropical nut and spice taxa
- 96 Guam taxa
- 73 Ogasawara Islands taxa
- 72 Sri Lankan taxa
- 61 Mascarene Islands taxa
- 41 Madagascar taxa
- 12 Seychelles taxa

the garden directors who are currently considering Pfizer's offer have also been contacted by Phytera. But Phytera's efforts are best known in Europe, where it has been actively contacting botanical gardens and seeking the opportunity to screen garden collections.

Phytera's contracts provide for a per-sample cash payment of about U.S. \$15 and a small royalty (.25% to 2.5% of Phytera's proceeds) to the garden if the sample is used in a new drug. Phytera has signed contracts with "less than eight" botanical gardens, including London's Chelsea Physic and the Berlin Botanical Garden in Germany.⁹

While Chelsea Physic, which has a similar access arrangement with Glaxo Wellcome, is apparently amenable to the deal, some other botanical gardens are not. When Phytera approached Frankfurt's Palm Garden, the contract was leaked to Christine VonWeizäcker of the German NGO Ecoropa, who subsequently confirmed that the Berlin Botanical Garden was one of the seven gardens who have agreed to Phytera's offer.

Phytera was caught unaware when RAFI, Ecoropa, and Third World Network went public with the deal at the FAO Technical Conference on Plant Genetic Resources in Leipzig, Germany in June. When contacted by the *New Scientist*, Phytera's vice-president John McBride pointed out that its contracts said a share of the botanical gardens' royalties (not Phytera's) would be returned to the country of the plant's origin.¹⁰ But McBride came up short when he was told that the leaked Palm Garden contract, which was drafted by Phytera's lawyers, contained no such provisions. "What can I say? I'm embarrassed", McBride told the *New Scientist*.

But the stakes are considerably greater than Phytera's public image. Ecoropa is investigating Phytera's contacts with other European botanical gardens, and indications are that the company has approached dozens of gardens in central and eastern Europe. RAFI's survey of U.S. botanical gardens confirms that Phytera has been active in North America as well. Phytera's known targets include major medicinal and tropical plant collections - a wealth of biodiversity largely from the South. Phytera says it is also negotiating directly with several countries to obtain access to plants; but because the negotiations are difficult, it is "more dependent than we would like" on botanical garden samples.¹¹

U.S. National Cancer Institute: Screens Plants from Florida's Fairchild Garden

The U.S. National Cancer Institute (NCI) screens large numbers of plant samples and marine organisms collected by its contractors in foreign countries. According to the most recent accounting, the New York Botanical Garden (NYBG), the Missouri Botanical Garden (MBG), the University of Illinois at Chicago, and the Coral Reef Research Foundation were providing NCI with samples collected directly from 26 countries, plus "Antarctica and the Caribbean." The collections are made under standard terms laid out in NCI's "Letter of Collection".¹²

But NCI has also received samples from Fairchild Tropical Garden in Miami, Florida. NCI received the samples from the New York Botanical Garden. While NYBG was helping Fairchild recover from Hurricane Andrew, it was given permission to walk away with cuttings from Fairchild's holdings. Fairchild's collections include large numbers of plants from the South, with an emphasis on Caribbean and South American taxa. NYBG asked NCI to accept the Fairchild samples as part of NYBG's ongoing contract to make plant collections for NCI. The request was approved.

Dr. Gordon Cragg, Chief of NCI's Natural Products Branch told RAFI that, to his knowledge, the Fairchild samples were the only plants that his group has screened which were obtained from botanical gardens, and that the samples had, to his recollection, not yielded any major pharmaceutical "hits". Dr. Cragg was not certain, however, how compensation would have been handled if the plants had yielded a significant pharmaceutical find, nor how it would be handled if a similar situation arose in the future.¹³

"What can I say? I'm embarrassed."

-John McBride, Phytera's Vice-President, upon being informed that his company's own proposed contract contains no provision for benefit-sharing with countries of origin.

Morris Arboretum: Adapts Chinese "Happy Tree" to North America for "Pharming"

For most botanical gardens developing relationships with pharmaceutical companies is a secondary priority. Assisting drug development is peripheral to botanical gardens' main objectives, which are most often the acquisition, maintenance, and botanical study of wide varieties of taxa. Those few gardens expressing a serious interest in drug discovery generally view a relationship with a pharmaceutical company(ies) as a source of money to further the ends of the garden, rather than a primary goal of the garden itself.

One exception is the Morris Arboretum in Philadelphia (U.S.). Unlike most other botanical gardens contacted by RAFI, Morris specializes in temperate climate plants and has an ongoing consulting relationship with SmithKline Beecham (SKB), a pharmaceutical company also based in Philadelphia. In 1995, SmithKline Beecham was ranked the 8th largest pharmaceutical company in the world, with revenues of over U.S. \$11 billion. Morris considers the relationship "a good method to support industry."¹⁴

The most important work Morris botanists have done with SKB was to study the tree *Camptotheca acuminata* Decaisne (Xi Shu, or "Happy Tree"), a native of southern China. Xi Shu is the source of various kinds of camptothecins, compounds which show promise in the treatment of tumors and viruses (including HIV). Several camptothecins have been patented in the U.S., and SKB has been first to bring one to the U.S. market, with its "Hycamtin" treatment for ovarian cancer, approved for use in May of this year.

SmithKline Beecham was "uncomfortable sourcing the plant in Asia" and turned to the Morris Arboretum for help.

Morris' role in the development of Hycamtin was not in its discovery - its medicinal properties have been known for years - but in developing reliable ways to propagate it in the U.S. climate. According to Morris' Herbarium Manager, SKB was "uncomfortable sourcing the plant from Asia", and turned to Morris for help. Morris was successful in developing ways to farm the plant in the Southern U.S. Foresters at the Stephen F. Austin State University in Texas and Louisiana State University are now collecting Xi Shu germplasm and making preparations to commercially grow the tree in the U.S.¹⁵

BOTANICAL GARDENS REACT

Botanical gardens have been far from unified in their response to the companies' push. The 12 administrators from 10 different gardens contacted by RAFI expressed

a wide variety of opinions about issues raised by the CBD and their best course of action.

Some botanical garden scientists felt they should have total control over use of their collections. One garden researcher told RAFI the notion of negotiating with countries of origin for use of germplasm is "basically extortion" and an "absolutely appalling... way to enrich politicians that has nothing to do with sovereignty."¹⁶ Others took germplasm ownership issues very seriously and expressed a desire to find ways to ensure both consent and just compensation for the use of the South's genetic resources and knowledge.

When the CBD finally acts on botanical garden collections, it will signify a major change in gardens' usual way of doing business. International Association of Botanical Gardens (IABG) Secretary General Hernandez Bermejo writes "By and large, botanical gardens have for over 300 years kept up a traditional free exchange system... This system ensures great accessibility to all applicants... In nearly every case the final destination and utilization of the material sent remains unknown."

Clearly, when the CBD implements its legally binding commitments, botanical gardens will no longer be able to casually send germplasm to companies who request it.

Repeatedly, botanical garden staff cited their scant resources as a primary motivating factor in negotiating with pharmaceutical companies. They say poor funding forces them to turn to alternative sources of money to keep their collections alive. When the alternative is a company wishing to use plant collections for commercial purposes, this puts botanical gardens in the difficult position of negotiating access to somebody else's germplasm.

Many (but not all) directors, including some of the relatively few who are knowledgeable about the CBD, are unambiguous as to how they intend to deal with this thorny issue. "That's a question I will avoid for as long as I can" said one botanical garden director who has been approached by at least three pharmaceutical companies.¹⁷

CONCLUSION: WORK TO BE DONE AT THE CBD

The issue requires immediate action. The CBD's Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) meeting in Montreal 2-6 September, must address the sale of tropical plant biodiversity held in Northern botanical gardens. The CBD must insure that the issue moves toward final resolution when the Third Conference of Parties to the CBD meets in Buenos Aires in November, 1996. Successful efforts to place *ex situ* crop germplasm collections under intergovernmental control in 1994 offers an important model for the CBD to consider.

While the SBSTTA meets in Montreal, in nearby Burlington, Ontario the Canadian Government, with the financial support of Merck and Glaxo Wellcome, will be hosting the first ever meeting of Canadian botanical gardens. On the agenda are, among other things, the CBD, use of indigenous knowledge, and how botanical gardens can strike access deals with pharmaceutical corporations.

If the CBD does not follow through on its commitment to act, the Southern Parties to the Convention may lose half or more of the value of the biodiversity material that will be commercially useful in the next few decades. If this happens, the CBD will be reduced to a "gap-filling" organisation rather than the pre-eminent body to ensure the equitable sharing of biodiversity's benefits. This must not be allowed to happen.

• UPDATES •

Soybean Species Patent: Full Speed Backwards at Monsanto

Monsanto officials are lending new meaning to the term "novel transformation" after acquiring the plant biotechnology division of Agracetus from its parent company W. R. Grace. Before the U.S. \$150 million buyout in April, Monsanto had sought revocation of the Agracetus soybean "species patent" (EP 0301749B1, see *RAFI Communiqué*, March/April 1994).

MONSANTO'S ABOUT-FACE ON AGRACETUS' SOYBEAN SPECIES PATENT

IN 1994, THE COMPANY SAID:

"[Monsanto] requests that the patent be revoked in its entirety"

"Production of such a seed was obvious to the person skilled in the art"

"sufficient disclosure is woefully lacking"

"the alleged invention lacks an inventive step"

"not... novel"

(from Opposition filed at the European Patent Office, November, 1994)

BUT AFTER BUYING AGRACETUS IN 1996:

"Monsanto will defend it"

(said Loren Wassell of Monsanto in an interview with RAFI, July, 1996)

The Agracetus patent was originally challenged by RAFI and a coalition of NGOs on moral grounds. Monsanto, Dekalb, Pioneer Hi-Bred, Ciba-Geigy and Sandoz (the latter two now collectively known as Novartis), and other biotechnology industry heavyweights also filed opposition to the patent based not on moral grounds, but technical ones.

Monsanto's 292 page patent opposition document shredded the scientific basis for the patent. Monsanto noted that the soybean species patent should be "revoked in its entirety", is "not... novel", "lacks and inventive step", and "sufficient disclosure [of scientific method] is woefully lacking."

But after buying Agracetus, Monsanto has changed its tune. Loren Wassell of Monsanto's Biotechnology Communications Department told RAFI of his company's 180 degree turn on the newly acquired patent. Far from dropping the patent that the company claimed failed to meet all major criteria for patentability, he says "Monsanto will defend it."¹⁸

Ecuadorean NGOs Stop Bilateral IPR Agreement with the United States

Ecuadorean NGOs foiled an attempt by proponents in Ecuador's Congress to ratify a bilateral intellectual property agreement with the US. Ratification of the treaty would have required Ecuador to honour and enforce US utility patents on living organisms. The news is a victory for NGOs, but a setback for the U.S. Department of Commerce, which is pressuring several Latin American governments to approve similar agreements.

In late July, on the last day of its session under the outgoing government, the treaty was suddenly and unexpectedly brought up for approval by its backers in the Congress. A sit-in on the Congress floor was quickly organized by the NGO *Acción Ecológica*, and with the help of Congressional allies, caused the session to be closed before any action was taken to approve the treaty.

The dramatic conclusion of the Ecuadorean debate followed weeks of public discussion in Ecuador of the negative impacts of biopiracy and life patenting. In particular, the case of the US patent issued on the Amazonian indigenous peoples' plant *ayahuasca* (see *RAFI Communiqué* Nov/Dec, 1995), was used to demonstrate how easily Ecuadorean resources and indigenous knowledge could be usurped through U.S. patent laws and result in Ecuador having to honour U.S. patents on its own resources.

Latin American government officials report that U.S. trade representatives are applying intense pressure for approval of bilateral IPR treaties in Andean countries. In Quito, they tried to allay Ecuadorean NGO concerns about biopiracy by implying that President Clinton's signature on the Biodiversity Convention, without US Senate ratification, meant that the US was going to play by the CBD's rules. Not only were the CBD's rules and promotion of bilateralism unsatisfactory for the NGOs; but, as was pointed out at the meeting, the US government official's argument that the US president's signature is tantamount to Senate ratification is wrong, and a misrepresentation of the US legal system.

After celebrating their victory, Ecuadorean NGOs and those in some other Latin American countries, are bracing themselves for more attempts by the US to force bilateral IPR agreements in the coming year.

U.S. Cotton Farmers Irate Over Failure of Monsanto's Costly Transgenic Seed

The commercial debut of Monsanto's genetically-engineered "Bollgard" cotton is running into serious problems from crop pests. Monsanto promised farmers "peace of mind" through "season-long in-plant control... [that] stops worm problems before they start." But now, halfway through Bollgard's first season, farmers are "irate" because bollworms (*Helicoverpa zea*) are devouring their fields. A crop consultant in Texas told the *Wall Street Journal* that unless things improve, Monsanto "won't sell another product in our area, I promise you that."

Monsanto's Bollgard cotton is a transgenic variety that has been engineered with DNA from the soil microbe *Bacillus thuringiensis* (Bt) to produce proteins poisonous to cotton pests. Farmers were told that Bollgard would be effective against bollworms "without the use of in-season sprays." (emphasis Monsanto's). But with bollworm infestation running "at 20 to 50 times the levels that typically trigger spraying," Bollgard cotton growers in at least 5 states have been forced to buy and apply expensive pesticides despite the premium prices they paid for the high-tech seed.

Monsanto says 648,000 hectares of its Bollgard cotton were planted in the U.S. this year.¹⁹ Because Monsanto charged farmers a U.S. \$79 per hectare "technology fee" (in addition to the price for the seed itself) for the right to plant Bollgard, the company has generated U.S. \$51 million in fees this year alone.

Farmers hoping to recoup this year's projected loss by replanting their cotton seed (a practice common with cotton) are out of luck because of the highly restrictive rules Monsanto has placed on use of the intellectual property-protected seed. The company puts it this way: "Monsanto is only licensing growers to use seed containing the patented Bollgard gene for *one crop*. Saving or selling the seed for replanting will violate the limited license and infringe upon the patent rights of Monsanto. This may subject you to prosecution under federal law." (emphasis Monsanto's).

"Saving or selling the seed for replanting will violate the... patent rights of Monsanto. This may subject you to prosecution under federal law."

--- From Monsanto's statement to farmers interested in growing Bollgard

In the face of harsh criticism from farmers and headlines like "Cotton Bugs Cast Doubt on Seeds" and "Insects penetrate genetically engineered cotton", Monsanto's public relations officials are retreating from their company's previous claims. They say that the problem is simply that bollworms are unusually prevalent this year. Monsanto now claims "You can never guarantee 100% control 100% of the time", and Bollgard "is performing as well as we expected... this year."

Bollgard's failure comes close on the heels of serious problems with "Flvr-Savr", a tomato variety with genetically-engineered delayed ripening released by Calgene last year. Monsanto, which is moving to dominate agricultural biotechnology by buying out its competitors, purchased a majority interest in Calgene, putting Monsanto in the unenviable position of presiding over two disastrous releases of new transgenic crops.

Bt crops are not new to controversy. Several corporations are bringing maize, potatoes, and other Bt-engineered crops to market, while in U.S. courts they sue each other over who "owns" the many insecticidal proteins produced by the microbe. Bollgard's failure to control bollworms - in its first year of release, no less - is disturbing for the entire biotechnology industry. If

bollworms can easily survive and reproduce on the insecticidal cotton, then the pest will likely develop resistance to the new seed, making its Bt genes useless and leaving disturbing implications for the dozens of other planned Bt-engineered varieties.

But much more is at stake than corporate profits. Spray formulations of Bt have been used as an organic pest control for years without serious resistance problems. If pests quickly develop Bt resistance as a result of the new crops, Bt will cease to be an effective natural biological control. Prior to news of this year's Bollgard failure, the Union of Concerned Scientists (a U.S. NGO) warned that "...inadequate plans for monitoring and mitigation [of resistance] intensify concern that neither the government nor the companies can assure that Bt will not be lost as a result of the use of Bt crops."

When asked to comment, the U.S. Environmental Protection Agency (EPA), which recently approved the cotton's sale, said that it takes the new reports of Bollgard's failure in the field "extremely seriously." But the EPA downplayed their significance by peevishly speculating that maybe "someone mess[ed] up a shipment" and mislabeled regular cotton seed. But with cotton growers from across the U.S. South reporting infestation problems, the EPA's speculation does not seem credible.

¹ Data for this section is principally derived from J.E. Hernandez Bermejo's paper "Evaluación de las colecciones ex situ conservadas en jardines botánicos". In addition to his work at IABG, Hernandez Bermejo is Director of the Botanical Garden at the University of Córdoba, Spain. Additional information comes from *RAFI Communiqué*, January/February, 1996.

² Some gardens RAFI contacted were happy to provide samples, especially in small numbers, to anyone who wished to have them.

Others distinguished between groups requesting samples for commercial or non-profit purposes. Since many botanical gardens are dealing with widespread commercial interest in their collections for the first time in years, many have yet to establish fixed access policies for commercial organizations.

³ Telephone interview with Dr. Charles Lamoureaux, Director, Lyon Arboretum, August, 1996.

⁴ Edwards, Rob. "Biotech firm 'embarrassed' by leaked plant deal", *New Scientist*, 29 June 1996, p. 7.

⁵ Telephone interview with Holly Forbes, Assistant Curator, University of California Botanical Garden, Berkeley, CA, August, 1996. Forbes said that Shaman Pharmaceuticals, Escagenetics, and Nature's Way had requested plants from UC-Berkeley.

⁶ Details on the Pfizer proposal were provided to RAFI in telephone interviews with three botanical garden directors in Hawaii: Keith Woolliams of the Waimea Arboretum and Botanical Garden, Charles Lamoureaux of the Lyon Arboretum, and Michael Kristiansen of the Honolulu Botanical Garden.

⁷ *Industrial Bioprocessing*, "Company to Watch - Phytera Develops Plant-Based Pharmaceuticals", April 1994, p. 6.

⁸ From the Plant Collections Directory (v. 2.0), database published by the American Association of Botanical Gardens and Arboreta, 1994.

⁹ Edwards, Rob, p. 7.

¹⁰ *New Scientist* reports that Chelsea Physic officials confirmed this to be true in the case in their contract with Phytera.

¹¹ Edwards, Rob, p. 7.

¹² "Medical Products from the Natural World and the Protection of Biological Diversity", report prepared by the Fogarty International Center, National Institutes of Health, Bethesda, MD, USA, n.d.

¹³ Telephone interview with Dr. Gordon M. Cragg, Chief, Natural Products Branch, National Cancer Institute, Frederick, MD, August, 1996. Fairchild researchers also confirmed NYBG's collections and subsequent provision of the samples to NCI.

¹⁴ Telephone interview with Rick Lowendowski, Herbarium Manager of Morris Arboretum, August, 1996.

¹⁵ Information about the universities' work and related information can be found at the Stephen F. Austin State University Forestry Department internet site at: <http://www.tc.sfasu.edu/tucker/medplants.html>.

¹⁶ Telephone interview with an anonymous (name withheld by RAFI) research scientist at Fairchild Tropical Garden, Miami, Florida, August, 1996.

¹⁷ Telephone interview with Dr. Charles Lamoureaux, August, 1996.

¹⁸ Telephone interview with Loren Wassel of Monsanto's Biotechnology Communications Department, July, 1996.

¹⁹ U.S. press reports have placed this figure even higher. Our figure is the one given by Monsanto representatives who answer the company's Bollgard information telephone line.



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