

ISSUES OF SAFETY AND OWNERSHIP IN BIOLOGICAL CONTROL INTRODUCTIONS: THE BRAZILIAN CASE

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ABSTRACT

The importance of biological pest control in Brazil has increased considerably in the last two decades. A number of projects conducted in the country have resulted in significant reductions in the levels of several pests, through the introduction of non-indigenous or management of native biocontrol agents. Since 1991, the Brazilian Quarantine Laboratory for biological control agents has played an important role in the development of classical biological control in the country, collaborating with national and foreign research institutions. Brazil has a set of rules concerning the exchange of organisms with other countries. Regulation in effect is presently under re-evaluation. Permits for introduction, exploration and export of biocontrol agents are required. Issuance of permits is facilitated if those activities are part of previously established, broader cooperative agreements involving national and foreign institutions.

INTRODUCTION

The importance of biological pest control has increased considerably in Brazil in recent years. Even greater development is now expected, with the thrust for the use of more natural means of agricultural production, driven by international demands expressed with the Convention on Biological Diversity and the implementation of ISO 14,000 series (the set of standards related to environmental impact of production processes, established by the International Organization for Standardization). Studies on biological diversity around the world are expected to promote the discovery of prospective organisms to be used in biological control (Srivastava *et al.*, 1996). The biodiversity found in Brazil may offer outstanding opportunities for the control of pest species within and outside the country, especially in relation to noxious species originating in Brazil or their close relatives.

HISTORY OF BIOLOGICAL CONTROL IN BRAZIL

The first recorded attempt at the practical use of natural enemies for pest control in Brazil occurred in the beginning of this century (Lopes, 1920), and concerned the importation of the parasitic wasp *Prospaltella berlesei* (Howard) for the biological control of the scale insect *Pseudaulacaspis pentagona* (Targioni-Tozzetti). Several other introductions followed, although at a slow rate, mostly because of the small number of researchers dealing with this type of pest control (Robbs, 1992). One of the most successful projects concerns the control of the sugarcane borer, *Diatraea saccharalis* F., by two Asian strains of the parasitoid

Cotesia flavipes (Cam.). Successful results have also been obtained with the use of native entomopathogens for the control of pest species; outstanding examples involve the use of *Metarhizium anisopliae* (Metschnikoff) for the control of sugarcane leafhoppers and *Baculovirus anticarsia* for the control of the velvet bean caterpillar (Campanhola *et al.*, 1995).

In the last two decades the number of biocontrol specialists in Brazil has increased significantly, with the training of a number of young scientists at renowned biocontrol centers around the world, especially in North America. Today, considerable effort is dedicated to this speciality in nearly 150 laboratories across the country (Sousa Dias *et al.*, 1993). Results of those works are regularly discussed in a traditional symposium held once every two years, specifically dedicated to biological control.

Until recently, one of the main constraints to the development of classical biocontrol projects was the absence of adequate facilities in the country for the quarantine of introduced organisms. Since 1991, the National Quarantine Laboratory (Laboratório de Quarentena "Costa Lima",) located in Jaguariuna, State of Sao Paulo, has interacted with researchers from different institutions to cooperate with their projects and promote biocontrol activities. Until now, the Laboratory has processed almost 40 introductions of biocontrol agents, involving predators, parasitoids and pathogens. It is also one of the mandates of the Laboratory to interact with foreign institutions for export of biocontrol agents.

LEGISLATION ON INTRODUCTION OF BIOCONTROL AGENTS

Brazil has a set of regulations concerning the introduction of biocontrol agents, based mostly on a Presidential Decree established in 1934 to regulate plant health activities. One of the main aspects of that Decree is the ban on the importation, commercialization, transit and exportation of live insects, mites, nematodes, microorganisms and other plant parasites, and of soil and plant products that may harbor microorganisms, insects and other plant parasites.

However, the Decree also states that the Ministry of Agriculture may allow the importation of those organisms, under pre-established conditions, for experimental purposes in scientific institutions. A specific set of legislation applies to the case of biological products to be introduced for commercialization.

Introductions for scientific research

The Brazilian National Quarantine facility plays a major role in the introduction of biocontrol agents for scientific research. Upon request, it may advise interested professionals on preparation of documents needed for the request of permits to be issued by the Ministry of Agriculture. It may also assist interested professionals in locating suitable sources of agents for introduction. In addition, it is responsible for providing information to the Ministry of Agriculture concerning technical aspects related to the convenience of each introduction, in consonance with a supporting technical committee attached to it, composed of three biocontrol specialists that work for different institutions.

Permits can only be issued to official research institutions. They allow introduction of organisms into quarantine, where authorized material is identified, screened and isolated.

After the necessary observation and studies under contained condition, to secure the safety of the introduced material, the Ministry of Agriculture is informed in order to issue a second permit to allow their release from quarantine to the interested institution and ultimately to the field. Once material is released, the requesting institution is required to present biannual reports on the project for a period of two years, referring to the fate of the introduced organisms, status of establishment in the field, preliminary effect on the pest population and possible unexpected environmental impact. In turn, the Laboratory prepares regular reports to the Ministry of Agriculture, which is also made available to the general public via INTERNET at <http://www.bdt.org.br/bdt/biocontrol>.

Introductions for commercial purposes

Research, production, commercialization, use, importation and registration of pesticides in general are regulated by the Federal Law nr. 7,802 (July 1989), and the Presidential Decree nr. 98,816 (January 1990). A specific regulation for the registration of microbial pesticides concerning environmental and health effects has been recently proposed and should soon be implemented by the federal regulatory agencies (De Nardo *et al.*, 1995). Discussions on the need and convenience for a similar regulation for registration of parasitoids and predators have barely been initiated. Large scale importation of those organisms for commercial purposes has not been stimulated, on the ground of the risk of parallel introduction of contaminants. Growing national production of predators and parasitoids and/or regular importation in large scale will eventually lead to the need to establish a regulation concerning their quality control, as occurred in several countries in Europe (Bigler, in press).

The Decree requires that introduction of a biopesticide produced in another country and still not registered in Brazil be submitted to quarantine, before an Experimental Use Permit can be issued. In quarantine, it is evaluated according to requirements established by regulatory agencies, in relation to mammalian toxicology, nontarget organism hazards and environmental fate and expression. Subsequent introductions of such products are not required to pass through quarantine, but should carry a quality control certificate.

PROTOCOL FOR RISK ASSESSMENT IN QUARANTINE

A simplified working protocol for risk assessment of organisms to be introduced into the country was developed by the Quarantine Laboratory staff. It is based mainly on FAO's Code of Conduct for the Import and Release of Biological Control Agents (FAO, 1996) and Coulson *et al.* (1991), complying as well with what has been agreed upon by signatories of the international Convention on Biological Diversity. Basically, it determines that the result of the evaluation of requests by the Laboratory's advisory committee be analyzed by the General Head of the laboratory in cooperation with the Technical Head. Possible disagreements are communicated to the committee members, so that a consensus is reached. A consolidated evaluation is prepared by the General Head and sent to the Ministry of Agriculture for issuance of permits for the introduction of the organisms into quarantine. In general, introductions are not authorized before the local natural enemies associated with the pest to be controlled are adequately known.

Once a shipment arrives at a national port, one of the quarantine staff members receives and takes it to the Laboratory, where it is immediately processed. Package and all other

accompanying material are separated from the natural enemies whose introduction was authorized, and incinerated. In case of parasitoids introduced on or in the host, both are held in the laboratory until emergence of adult parasitoids, which are then allowed to parasitize only new hosts obtained in Brazil. Remains of the parasitized hosts received from abroad are then incinerated. At least one generation of the natural enemy received is reared in quarantine to allow identification of possible pathogens or hyperparasites that are then destroyed. Examples of all organisms received are collected and properly identified by specialists. If the organisms cannot be separated morphologically from other native or previously established organisms, a proper molecular characterization of the introduced species is required. Voucher specimens are kept in the museum attached to the Quarantine Laboratory.

When the introduced natural enemies are well known from previous studies and there is no indication that they may cause unwanted side effects upon release in the new environment, the General Head of the Laboratory requests the authorization for field releases from the Ministry of Agriculture. The material is then delivered to the institution that requested the introduction. When the introduced natural enemies are not adequately known or there are indications of their possible unwanted effects on nontarget organisms, investigations are determined, to be conducted either in the country of origin of the natural enemies or, most commonly, in quarantine. Investigations consist basically of the evaluation of the specificity of the natural enemies in relation to nontarget organisms found in Brazil.

When natural enemies to be introduced have been genetically modified, then request for permission to introduce is evaluated by the Brazilian Technical Biosafety Committee, attached to the Ministry of Science and Technology, before the Ministry of Agriculture issues the permit for introduction. The committee is composed of 18 members representing private and official segments of society (Scientists, Consumer Rights, Biotechnology Companies, Labor Health and the Ministries of Agriculture, Science and Technology, Health, Environment, Education and Sports, and Foreign Relations). Evaluation is based on a protocol similar to those adopted by Australia and the United Kingdom, that take into account the characteristics of the source organisms. The role of the Committee complies with Article 8 of the International Convention on Biological Diversity, which indicates that each of the signatory countries should establish or maintain means to regulate, administer and control risks associated with the use and release of organisms modified by biotechnology, that can cause negative environmental impact affecting the conservation and sustainable use of biological diversity and human health. One of the main concerns at the international level is the reduction of biodiversity, especially in the tropics.

REGIONAL PERSPECTIVE

Brazil is one of 156 signatories of the Convention on Biological Diversity, installed in 1993. One of the principles of the Convention refers to the sovereignty of each country in relation to the management of its biodiversity, provided it does not negatively affects other countries. In terms of classical biological control, a country may be held liable for the introduction of an organism that results in its spreading to other countries where the organism is unwanted.

Considering that once released, introduced natural enemies are often bound to spread to large ecologically similar areas, a regional approach toward classical biological control was considered convenient. To facilitate this approach, an international committee known as

COSAVE (Plant Health Committee) was established by countries of the Southern Cone of South America, i.e. Argentina, Brazil, Chile, Paraguay and Uruguay, to harmonize different national legislation concerning all aspects of plant health.

COSAVE is composed of the Ministries of Agriculture and the coordinators of the Plant Health Inspection Services of the participating countries, a technical secretariat and eight specific work groups, one of which is dedicated to biological control. Harmonization of regulations for importation, quarantine, registration, use and management of biocontrol agents and biopesticides is one of the main objectives of that group. The need for such harmonization became evident with the increased movement of agricultural products across the borders after the establishment of MERCOSUL (Southern Cone Common Market).

The goal of the harmonization is to promote the optimization of the use of regional capability, allowing the establishment of mechanisms to permit the general acceptance of results of evaluations conducted in any of the five countries. It should facilitate the implementation of biocontrol in the region, while considering the interests of each country and complying with pre-established safety standards. In this way, a quarantine laboratory in one country will be allowed to process agents to be used in any country in the region. Also, results of tests of biopesticides conducted in one country will be accepted for registration in other countries, reducing bureaucracy and registration costs.

The biocontrol work group has met twice a year since 1994, and until now has prepared the following standard documents (Mondaca-Rivas, 1996): Guide for import, export and release of biocontrol agents; Quarantine protocol for biocontrol agents; Certification of quarantine laboratories; and Requirements for registration of biopesticides. The first two documents have been approved by the Director Committee of COSAVE, while others will be evaluated by the Director Committee by the end of 1996. General information on the activities of the work group and the documents produced are available on-line at the "International Information System on Biological Control" at <http://www.bdt.org.br/bdt/biocontrol>.

EXPLORATIONS IN BRAZIL FOR BIOCONTROL AGENTS

From an applied point of view, biological control strategies involve the management or use of natural enemies as an ecologically sound approach to pest control, promoting the equilibrium of populations of detrimental organisms at acceptable levels. Naturally occurring biological control is highly relevant to the conservation of local biodiversity, a fact recognized by biocontrol specialists long before the recent widespread emphasis on conservation and rational use of biodiversity.

The widely recognized importance of biodiversity, promoted by the international Convention on Biological Diversity naturally led to the placement of value to genetic resources around the world (Waage, 1996). This has raised the issue of intellectual property rights and ownership of biological material. How this will impact the use of biodiversity in general and the exchange of biological control agents in particular is still unsettled. As stressed by Srivastava *et al.* (1996), genetic material has historically moved freely among nations, contributing enormously to gains in crop production. Giving values to biological material will expectedly incentive conservation, but also raises a series of issues related to compensation and exchange of organisms. Brazilian legislation in effect today was brought into effect

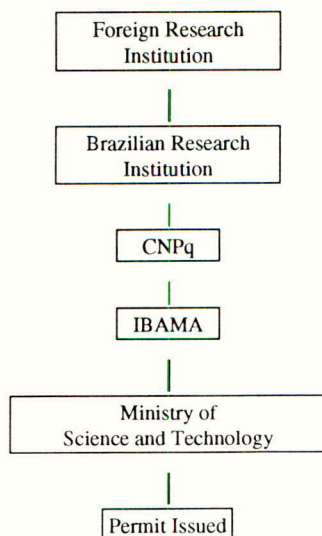
before the establishment of the Convention on Biological Diversity. It is expected that some changes will occur in the near future. Here follows a discussion of present legislation.

There is no specific regulation in Brazil concerning the collection of natural enemies for biological control purposes. There is however a set of legislation and regulations pertaining to the collection of organisms in general by Brazilian and foreign scientists, that are applied to biocontrol agents. A recent revision of those documents was done by Moraes *et al.* (1996).

Federal Law nr. 5,197 (January 1967) indicates that special permits for the collection of material for scientific studies may be issued to scientists working for official institutions. However, the permit cannot be used for game or commercial purposes. In addition it establishes that no special permit is necessary for Brazilian scientists to collect invertebrates for scientific or didactic purposes, except in protected areas or when the species to be collected is threatened. IBAMA (Brazilian Institute of the Environment) is presently revising the related regulation, the new version of which will probably propose the requirement of a specific permit for those circumstances.

According to Federal Decree 98.830 (January 1990), explorations by foreigners require a special permit, which can only be issued if the proposed work is conducted in cooperation and with the co-responsibility of a Brazilian institution of recognized technical and scientific capability in the corresponding specialty. Such permits are requested through "Superintendência de Cooperação Internacional; CNPq (Conselho Nacional de Pesquisa); SEPN 507, Bloco "B", Edif. Sede CNPq; 70740-901 Brasília, DF; telephone +55-061-348-9440/9441; fax +55-061-9449. Figure 1 indicates the path to obtain the permit for a foreign exploration work in Brazil.

Figure 1. Flow chart of the evaluation of requests for foreign explorations in Brazil



The Ministry of Science and Technology will render special treatment to processes related to data and material collected by foreigners within the frame of scientific agreements with Brazilian teaching and research institutions. It is understood that the interest of Brazil and the advantage to the country in those cases would have been duly evaluated at the establishment of such agreements. "Portaria 55" (March 1990) of the Ministry of Science and Technology regulates Decree nr. 98,830, specifies that any material collected and later identified as type specimens will be deposited in a Brazilian museum. The same regulation indicates that foreigners must hold specific official visas to conduct collection activities within the country.

The same "Portaria" indicates that no specific authorization from the Ministry of Science and Technology is necessary when the collecting activities by foreigners are done within the scope of:

- Scientific exchange programs related to cultural, technical or technological agreements of the Brazilian government;
- International organization programs previously approved by the Brazilian government;
- Scholarship and research programs sponsored by CNPq, CAPES (Coordenadoria de Aperfeiçoamento de Pessoal de Nível Superior), FINEP (Financiadora de Estudos e Projetos) or the research foundation of each Brazilian state;
- Work contracts with Brazilian institutions of high education and/or research.

However, even in those cases CNPq should be notified of the intended collection activities. Exemption of the special permit does not exempt the institutions to comply with other requirements mentioned in Decree 98,830, especially in relation to follow-up of the research and the fate of the collected material.

EXPORT OF BIOCONTROL AGENTS

Federal Law nr. 5,197 states that international transport of wild animals, insects and their products requires an official permit, except if the material is addressed to an official scientific institution. Nevertheless, Presidential Decree 98,830 specifies that the shipment of any material collected by foreigners may only be done with the previous authorization of the Ministry of Science and Technology, and only when it is intended exclusively for scientific study or extension. IBAMA adopts today the recommendation of Decree 98,830, which additionally specifies that the material collected be shipped abroad by the participant Brazilian institution, which will maintain copies of the field collecting notes. "Portaria 55" specifies the material that the Brazilian institution, on behalf of the Ministry of Science and Technology, should retain to forward to an appropriate depository in the country. Part of those items will be holotypes or syntypes, 50% of the paratypes, as well as designated neotypes.

"Portaria" 29 of IBAMA states that definitive export of Brazilian wild fauna can only be done with specimens produced in commercial rearing or zoos. It also states that animals of the Brazilian fauna exported to scientific events and international conservationist agreements, as well as their offspring will continue to belong to the Brazilian government, upon discretion of IBAMA.

The same "Portaria" specifies that material collected by Brazilians needs specific exportation

permits, which are issued on request by IBAMA, provided the exportation will not negatively affect the natural population of the organism.

Updating the Brazilian legislation in this sense seems necessary as concern about threats to natural populations of collected biocontrol agents seems unlikely.

GENERAL COMMENTS

Biological control became an important research area in a few institutions in Brazil in the beginning of this century. However, only in the last two decades has the number of specialists in this area significantly increased, and has the exchange of ideas and material with counterparts from abroad reached significant levels. For this reason, institutions in charge of the enforcement of regulation related to exchange of organisms are only now interpreting general legislation for specific biological control purposes, and this may hinder decision making until experience is accumulated. Those professionals are used to analyzing processes dealing with organisms whose natural populations are much more prone to disruption as a consequence of overexploitation, because of their immediate commercial interest, than natural enemies of pest species.

The historical safety of biological control introductions, with respect to effects of collection on source population and of introductions on non-target species in new environments, should allow flexibility of regulations in terms of collection and exchange of organisms for scientific work. Updating of the legislation should consider that, unlike some other groups of animals, local natural enemy populations will probably not be threatened by collection for export. On the other hand, it is significant that the present Brazilian legislation does not make any comments about the export of microbial control agents collected in the country.

It is expected that the increasingly commercial potential of some groups of organisms will lead to adjustments in present legislation in Brazil and other countries, to safeguard national interests. The very emphasis on the conservation of biodiversity and allusion to unknown values of organisms is leading policy makers to consider this aspect in the re-evaluation of present regulations. While accepting that potential commercial value be considered in the revised regulations, efforts should be intensified at this point to avoid the establishment of undue barriers, that could hamper the cooperative environment prevailing today among biocontrol researchers around the world.

It is clear that the establishment of umbrella scientific agreements between foreign and Brazilian institutions greatly facilitates the conduct of specific activities of exploration and exchange of organisms of Brazilian origin. Such agreements should express the mutual interest of both parts, in terms of exchange of experience, material and information. Certainly, stronger international cooperation should only promote the use of biological control around the world, with benefits to society in general.

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