Biodiversity, traditional knowledge and patent right: the case of *Carapanaúba*[1]

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Abstract
This article aims to investigate the existence of a possible logic of colonial appropriation in the international patent system, through information collected in the *patentscope*, a database from the World Intellectual Property Organization (WIPO). Therefore, a study is carried out according to ethnographic reports and scientific articles on the natural genetic resource *Aspidosperma sp*., a plant occurring in the Amazon Forest, known as Carapanaúba. The data are collected, coded and compared using Grounded Theory, based on Kathy Charmaz's studies (2009), and the rules of inference from Gary King and Lee Epstein (2014). The ideas of Walter Mignolo (2008) and Aníbal Quijano (2000) are used as a theoretical point of departure. As a result of this research, a theory is extracted from the data, that is, the overlapping of the patent system with traditional knowledge is evident, demonstrating a relationship of appropriation and colonial power imposed from developed countries over developing countries.

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Keywords: *Carapanaúba*. *Aspidosperma*. patent. WIPO.

Resumo

Este artigo possui o intuito de investigar a existência de uma possível lógica de apropriação colonial no sistema internacional de patentes, por meio de informações coletadas no *patentscope*, base de dados da Organização Mundial de Propriedade Intelectual (OMPI). Para tanto, realiza-se um estudo segundo relatos etnográficos e artigos científicos sobre o recurso genético natural *Aspidosperma sp.*, planta de ocorrência na Floresta Amazônica, conhecida como *Carapanaúba*. Os dados são coletados, codificados e contrapostos por meio da Teoria Fundamentada nos Dados, com base nos estudos de Kathy Charmaz (2009), e das Regras de Inferência de Gary King e Lee Epstein (2014). São utilizadas as ideias de Walter Mignolo (2008) e Aníbal Quijano (2000) como ponto de partida teórico. Finalmente, a teoria é extraída dos dados, ou seja, evidencia-se a sobreposição do sistema de patentes ao conhecimento tradicional, demonstrando uma relação de apropriação e de colonialidade do poder imposto pelos países desenvolvidos sobre países em desenvolvimento.

Palavras-chave: carapanaúba. Aspidosperma. patente. OMPI.

Resumen

Este artículo tiene como objetivo investigar la existencia de una posible lógica de apropiación colonial en el sistema internacional de patentes, por intermedio de la información recopilada en *patentscope*, una base de datos de la Organización Mundial de la Propiedad Intelectual (OMPI). Por lo tanto, se realiza un estudio de acuerdo con informes etnográficos y artículos científicos sobre el recurso genético natural *Aspidosperma sp*., una planta que se encuentra en la selva amazónica, conocida como *Carapanaúba*. Los datos se recopilan, codifican y comparan utilizando la teoría fundamentada en los datos, basada en estudios de Kathy Charmaz (2009), y las reglas de inferencia de Gary King y Lee Epstein (2014). Las ideas de Walter Mignolo (2008) y Aníbal Quijano (2000) se utilizan como fundamento teórico. Finalmente, la teoría es extraída de los datos, o sea, la superposición del sistema de patentes con el conocimiento tradicional es evidente, lo que demuestra una relación de apropiación y colonialidad del poder impuesto de los países desarrollados sobre los países en desarrollo.

Palabras clave: *Carapanaúba*. *Aspidosperma* patente. OMPI

1. Introduction

This research aims to verify the existence of a possible dominant colonial logic in the process of organizing the international patent system, through data collection carried out in the patentscope, database from the World Intellectual Property Organization (WIPO). This is a case study involving the plant, found in Brazilian biodiversity, known as Carapanaúba or *Aspidosperma sp*. This natural genetic resource, occurring in the Amazon Forest, comes from the bark of tree used by traditional communities to treat various diseases of the human body. By accessing the patentscope, advanced search is promoted in the system through the keyword, Aspidosperma.

Using as a theoretical-critical point of departure the ideas of Walter Mignolo (2008) and Aníbal Quijano (2000), we try to analyze the patents granted, already registered at the patentscope database, in order to contrast these records with ethnographic reports and academic works which reveal the traditional knowledge of communities that use Carapanaúba in their local practices.

The data are collected, systematized and analyzed, according to the rules of inference proposed by Lee Epstein and Gary King (2014). In order to analyze this whole set of data stemming from the theoretical references, it also uses the Grounded Theory, described by Kathy Charmaz (2009), so as to codify them and categorize them in order, at the end, to produce a relatively more consistent theoretical generalization.

Thus, the results of patent collection and the scientific properties of Aspidosperma species, extracted via bibliographic review, are coded and categorized concomitantly with the analysis process so that a theoretical construction based on the research problem can be extracted.

As far as the research problem is concerned, the research question is whether the internationally adopted patent legal system contains indications for a possible appropriation of natural genetic resources of Brazilian biodiversity and associated traditional knowledge, thus reinforcing the colonial logic of domination of central countries over peripheral countries.

The theory that could be extracted from the data is that, from the comparison between the traditional knowledge found in ethnographic reports and the consequent use of natural genetic resources by the cosmetic and pharmaceutical industries belonging to

developed countries, the patent system disregard the knowledge from traditional communities, which may evidence a probable relationship of appropriation and coloniality of knowledge and power of developed countries over developing countries, as described by Mignolo (2008) and Quijano (2000).

It is important to highlight here that the theory based on the data consists in the generalization concerning the relations between conventional scientific knowledge and the knowledge of traditional peoples. Thus, the relationship of domination of developed countries over developing countries stems from a process of confirming the theoretical propositions of Mignolo (2008) and Quijano (2000). However, this confirmation is only possible after the process of constructing the theory based on the data because this specific generalization is constituted from coding relations and categorizations of specific situations encouraged by the patent legal system, which culminate in reinforcing the theoretical proposition on colonial domination.

Thus, there are two methodological aspects here: one that is structured more as confirmation of theoretical propositions and another that constitutes a specific theoretical construction process from data extracted from both the patent legal system and the ethnographic reports related to the use of Carapanaúba. In this specific theoretical generalization, it is intended to use the instruments of grounded theory, according to Kathy Charmaz (2009).

This article is divided into three parts, namely, the first part consists of an explanation about the plant of the genus *Aspidosperma*; the second refers to the methodology and data collection; the third part highlights the theoretical construction and confirmation from the collected data and, finally, final considerations are presented.

2. *Aspidosperma sp* and traditional knowledge

Carapanaúba, peroba, guatambu, pau-pereiro and *quina* are popular names regarding the genus *Aspidosperma*, found in South America, especially between Mexico and Argentina (Almeida, 2019). In Brazil, the highest concentration of species of this genus is found in the Amazon region, although they are also present in other phytogeographic domains,

such as the Atlantic Forest, *Cerrado* and *Caatinga* (Castello et al, 2019). Considering the 2 to 60 meters high trees, *Aspidosperma sp*. is used for traditional medicines as a remedy for liver disorders, for colds and as analgesic (Tanaka, 2006).

These forms of use of *Aspidosperma sp*. are related to the ordinary practices of traditional communities. As Diegues (2008) explains, these peoples are characterized by an in-depth knowledge of the nature, in a codependent relationship with it, which is reflected in the use and management of the natural resources, resulting in a way of life of their own. Moreover, the practices resulting from this knowledge have important rituals, myths and symbology, as well as subsistence activities, even though "the production of goods may be more or less developed" (Diegues, 2008, p.89). The author also recalls another important aspect in the characterization of traditional communities, that is, to recognize himself as belonging to that particular social group, a criterion that pinpoints the identity of a people.

Thus, it can be understood that traditional knowledge clashes with the world pattern of power of hegemonic centers, which produced a perspective based on measurements, quantification and objectification of what can be known (Quijano, 2000). According to Aníbal Quijano (2000, p. 343), modernity/rationality:

> It is the cognitive perspective produced over time since the whole of the Eurocentric world of colonial/modern capitalism and that naturalizes the experience of peoples in this pattern of power. That is, it makes them perceive how natural and, consequently as data, not likely to be questioned (free translation)[5]

This notion of dominant rationality can also be perceived in the studies of Antônio Carlos Diegues, as he claims that biodiversity has been widely studied by natural scientists, while social scientists are separated from discussions on this subject, although they have much to say about how nature can be preserved if connected to the way of living of traditional peoples. In this vein, Mignolo (2008) states that the decolonial option opens to the diversity of epistemic and political possibilities, oppressed by the supremacy of Western rationality.

[5] Original extract: Se trata de la perspectiva cognitiva producida en el largo tiempo del conjunto del mundo eurocentrado del capitalismo colonial/moderno y que naturaliza la experiencia de las gentes en este patrón de poder. Esto es, las hace percibir como naturales, en consecuencia como dados, no susceptibles de ser cuestionados.

This rationality is the one that guides, informs and structures the patent legal system, in order to exclude other knowledge from the process of analysis of inventions and creations. In this context, it is worth mentioning the relationship between copyright and string literature, in which the author Caldas Barros (2013) reinforces the relevance of concretizing the social role to intellectual property rights. From this perspective, it is important to evaluate the organization and the mode of operation of the patent legal system in order to verify traces of this Western rationality and this coloniality of power and knowledge in the operative logic of the patent system at the international level.

It is from the perspective of a traditional knowledge that brings within itself elements of creativity, inventiveness and innovation that it is intended to evaluate inventions based on the specific case of Carapanaúba in order to verify whether there are indicia elements of appropriation of this type of knowledge through the patent legal system.

3. Methodology and Data Collection

The choice of Grounded Theory is justified based on the questions proposed by Kathy Charmaz (2009, p. 63) so that the collected data are, in fact, significant for the empirical analysis targeted:

> Where did the data come from? Who participated in its construction? What did the authors intend? Did the participants provide sufficient information to make plausible interpretations? And do we have enough knowledge of the relevant areas to read and understand your words?[6]

Considering the first of these questions, the *patentscope* is validated as the database for the search of patents to the extent that this is the database organized by the World Intellectual Property Organization (WIPO) which provides information on patent applications in accordance with the International Patent Cooperation Treaty (PCT), and also contains documents from national and regional offices of the member States of the PCT. According to

[6] Original extract: "De onde vieram os dados? Quem participou de sua construção? O que os autores pretendiam? Os participantes disponibilizaram informações suficientes para que fossem feitas interpretações plausíveis? E possuímos conhecimento o bastante das áreas relevantes para ler e compreender suas palavras?"

the official WIPO website (2020), 153 member States have signed the PCT, which serves to validate this search mechanism as relevant and replicable.

In order to compare the data collected in the patentscope on patents related to the genetic resource of *Aspidosperma sp.* with ethnographic reports and botanical studies, the methodological parameters of the Grounded Theory were used, based on the aforementioned questions elaborated by Charmaz (2009). This comparison seeks to verify whether the use of plant properties belonging to the genus *Aspidosperma* by developed countries can indicate a relationship of appropriation of traditional knowledge, which, at face value, would demonstrate the ancient colonial logic of domination of central countries over peripheral countries as described by Mignolo (2008) and Quijano (2000).

The construction of such comparison begins with the collection and, later, data analysis. Following the rules of inference from Lee Epstein and Gary King (2014, p.15), in order to guarantee the reliability and replicability of the research, it is necessary to describe the process of data collection of this research so that other researchers can replicate it.

So as to analyze if patents have the potential to appropriate the traditional knowledge, the *patentscope* platform is used. The search for this information is performed through access to the WIPO website (https://www.wipo.int/portal/en/), where you should search for the "knowledge" tab in the menu and access the topic "PATENTSCOPE".

Then, when finding the search box, you must choose the advanced search and select the filter "any field", so that the keyword used, namely *Aspidosperma*, the genus of the plant researched here, can appear in the results in any field, either in the title or in its description. In addition, advanced search allows the researcher to choose the language of the patents obtained by searching the site. As the present research intends a global search, the "all" option has been selected.

In June 2019, 177 results of patent applications were obtained, each of them was analyzed individually: each result has a hyperlink that directs the researcher to a specific tab of that application, where additional information is found. It is important to know which application was actually granted and, to that end, in each result it was verified whether there was a number or date of grant of that patent application. The results that did not contain the

grant date or the grant number were discarded, remaining only 66 patents. In these inventions, a preliminary analysis was performed to find out if the genus (*Aspidosperma*) was used only as an example, either to demonstrate the state of the art or to indicate a possibility of use with a different sort of invention.

Regarding the "family of patents", that is, equal patents whose depositors designated the application for more than one national office of different countries, it was decided to evaluate the main application, whose information referring to the granting (or not) of the other offices is registered in the "National Phase" tab. After discarding all the repeated files, 8 granted patents remained, which were systematized in Table 1, transcribed below.

Table 1, elaborated from the above data collection, can be described as follows: the first column presents the title, that is, the name with which the patent was submitted in the original filing. The second column refers to the application number related to that patent. The third column presents the designated country(s) that granted the patent. The fourth and fifth columns show, respectively, the number and date of the grant.

Table 1 – Granted patents related to *Aspidosperma*

Title	Application Number	Designated Country	Grant Number	Grant Date
1. Small molecule inhibitors of hepatitis c virus	WO2011056630	US	13504822	03.11.2015
2. Use of uleine for the prevention and/or the treatment of infectious diseases	WO2011160684	EP	2010737300	25.03.2015
3. Application of tannins to reduce odor emissions from animal waste	US08137660	US	08137660	20.03.2012
4. Composition for treating aids and associated conditions	US20140023731	US	08771763	08.07.2014

5. Pyrrolo(2,3-d)carbazole derivatives and preparation thereof	CA1185605)	CA	-	16.04.1985
6. A new process of the synthesis of 3',4'-anhydrovinblastine, vinblastine and vincristine	CA1341262	CA	-	26.06.2001
7. Using plant extracts, or active ingredients purified from them, as lipolytic, slimming and anti-cellulitis agents, in cosmetic, nutraceutical or pharmaceutical compositions	FR2865652	FR	-	02.10.2009
8. Compositions and methods for increasing adipose metabolism, lipolysis or lipolytic metabolism via thermogenesis	US20080152732	US	07955624	07.06.2011

It is noteworthy, at this moment, that the methodology of grounded theory proposes other questions to the researcher about the collected data and its codification. "What types of comparisons can I establish between the data? How do these comparisons generate and communicate my ideas?" (Charmaz, 2009, p. 37). To find answers to such questions and to stick to the main problem of this research, that is, whether natural genetic resources of Latin American biodiversity are appropriated by developed countries through the patent legal system, information about the traditional use of *Aspidosperma* in academic studies and its properties used in laboratory research was collected. The codes in the patent descriptions set out in Table 1 are drawn. Once these codes are taken from patent descriptions, we start to search for bibliographic data in order to verify reports or experiences related to the traditional knowledge of the peoples from the Amazon region.

Thus, following the logic of grounded theory, it is possible to compare such data

inasmuch as, on the one hand, the information of the patents involving the compound of *Aspidosperma* and, on the other, the properties and uses that are related to traditional knowledge are verified. In this way, Table 2 was elaborated from the relationship between the scientific species of *Carapanaúba*, in the first column, and the codification of scientific properties, in the second column, and the codes of the traditional use of *Carapanaúba*, in the third column.

Table 2 – *Aspidosperma* species, properties and traditional use

Species	Property	Traditional use
A. nitidum	Antinoceptive effect and anti-inflammatory activity (Pereira et al, p. 7, 2006)	Contraceptive; treatment of inflammations of uterus and ovary; diabetes; stomach problems; cancer; fever; rheumatism; malaria; leprosy (Pereira et al, p. 2, 2006)
A. album e *A. polineuron*	*A. album* - antifungal, astringent, antithermal, also used as antiparasitic in malaria treatment (Fern, 2019); *A. polyneuron* - antifungal (Oliveira et al, 2009)	Malaria (Pereira et al, 2007)
A. excelsum	Antimalarial (Silva, 2018) Antimicrobic (Oliveira, et al., 2009)	Hepatitis, malaria, vasodilator, antiseptic, antimicrobial, healing, bronchitis, inflammation, fever, diabetes, cancer and malaria (Silva, 2018)
A. quebrachoblanco	*Vasodilator* (Oliveira, et al, 2009)	Aphrodisiac; antipyretic; emphysema, bronchitis; pneumonia; impotence; benign prostatic hyperplasia; asthmatic and cardiac dyspnea (Pereira, et al., 2007)
A. subincanum	Studies indicate action against diabetes and hypercholesterolemia - *(Oliveira et al. 2009)*	Diabetes mellitus (Almeida, 2019)
Aspidosperma pyrifolium	-	Anti-inflammatory; Dermatitis (Ceravollo, 2018).

Once a literature review about these uses is carried out, it is possible to observe that a certain form of use may be related to a specific *Aspidosperma* species. Considering that at least 67 species of *Aspidosperma* (Castello et al, 2019) exist in Brazil alone, the best option is to codify the use of traditional knowledge considering the properties and uses of the plant genus disseminated in the specific literature, which describes the practices of traditional peoples.

However, this coding process, though carefully carried out, may not be entirely certain when establishing the patents' features selected from the *patentscope*, especially on two facets. The first is due to the limitation that there may be patents that use *Aspidosperma sp.*, but does not contain this name in its description, only its chemical formula, therefore, such results may not be covered by the research, especially when considering the high number of species of the genus.

The second facet is the fact that the patent applications do not provide enough information to relate exactly the species used by them, to those objects of the practice of traditional peoples. In fact, it may occur that a species used by the Amazonian communities to deal with a certain malaise, for example, which is manipulated in the patent description for another purpose, or even, the same purpose, but utilizing a different species of the plant. Thus, collecting information about the chemical properties of the species was performed in order to obtain more comprehensive perceptions in the descriptive report of the patent application. In this perspective, when a pharmacological use is discovered for a species, there is an expectation that the family of this species is potentially promising (Zhu et. al, 2011).

Thus, the objective is to seek a possible relationship between the uses and properties of *Aspidosperma* species in the descriptive application of the patents granted. Although the invention does not have the specific name of the species found in the literature review, the intention is to understand if its properties were effectively used, for what unites the species in the same genus Aspidosperma is the presence of indolic alkaloids that confer a wide spectrum of biological activities recognized to them (Henrique, 2010).

After a more in-depth study of the description of each of the patents systematized in Table 1, Table 3 was constructed in order to synthetically reveal the specific action of the

genetic resource in the invention, as well as the species used. At this stage, items 3, 4 and 6 from Table 1 were disregarded, since, in these patents, the description did not explicitly contain the specific action of *Aspidosperma* in the invention, remaining, thus, only five patents granted that refer to the use of the genetic resource of the aforementioned plant.

Table 3 – Use of the genetic resource in the Patent

Title of the Patent	Use of *Aspidosperma*	Especies
1. Small molecule inhibitors of hepatitis c virus	Aspidosperma alkaloids are used as inhibitors of the hepatitis C-causing virus	Not specified
2. Use of uleine for the prevention and/or the treatment of infectious diseases	Ulein, found in the bark of *A. Subinanum*, is the active ingredient in a dietary supplement used to improve the physical conditions of AIDS sufferers, as well as relieve the symptoms of "opportunistic diseases", including Cancer. The description also points out that the bark is traditionally used to treat fever, ulcer, syphilis and to stimulate uterine contractions.	*A. subinanum*
5. Pyrrolo(2,3d) carbazole derivatives and preparation thereof	The synthesis of Aspidosperma, which have therapeutic vasoldilator effects.	Not specified
7. Using plant extracts, or active ingredients purified from them, as lipolytic, slimming and anti-cellulitis agents, in cosmetic, nutraceutical or pharmaceutical compositions	Bark extract from *A. Quebrachoblanco* is able to modulate the activity of receptor membranes and enzymes involved in the lipolysis process, promoting weight loss and cellulite reduction.	*A. Quebrachoblanco*

8. Compositions and methods for increasing adipose metabolism, lipolysis or lipolytic metabolism via thermogenesis	The extract of *A. Quebrachoblanco* improves the lipolysis process, accelerates metabolism and has thermogenic action. Thermogenesis is directly related to vasodilation.	*A. Quebrachoblanco*

4. Theoretical construction and confirmation from the data presented

Following Charmaz's guidelines (2009, p. 74) on grounded theory, the questions are "what do the data suggest or affirm? From whose point of view?" Therefore, the previously coded data indicate uses of *Aspidosperma sp.* both from the traditional point of view and from the viewpoint of the natural sciences through its properties. The data in Table 3 are the result of a possible relationship between the patents granted and the traditional use of *Aspidosperma sp.*.

Starting with the analysis of Table 2, *Aspidosperma nitidum*, better known as *Carapanaúba*, is popularly used in the treatment of inflammations, besides serving the Amazonian communities in the treatment of malaria and the Colombian Indians Makuna and Taiwano, in the cure of leprosy (Pereira et al, 2006). It is noteworthy that the traditional use of *Aspidosperma nitidum* has contributed to studies that have demonstrated the antinoceptive effects in laboratory research, those that reduce the effects of pain, as stated by Pereira and others (2006).

Another traditional use of the resource that has also been corroborated in laboratory research is the use of *Aspidosperma album* for malaria treatment (Pereira et al, 2007). In addition, other properties found of this species, such as those described in Table 2, are antifungal, astringent, anti-thermal. Antifungal activity is also observed in the species *A. polyneuron*, which comes from indole alkaloids, a relevant feature of the genus *Aspidosperma*.

Aspidosperma polyneuron, traditionally used for the treatment of malaria, had this specific use scientifically proven, when tested in vitro against this parasite (Ceravollo, 2018).

Aspidosperma excelsum, also called *sapopema*, is used for various infirmities by traditional communities, both in Brazil and in Peru, by the Shipibo-Conibo indigenous people. Moreover, beyond the other uses described in table 2, antiseptic is a feature present in at least six alkaloids of this species, and this feature is proven to function as the inhibitory growth activity of *Bacillus subtilis* (Oliveira et al, 2009).

Aspidosperma quebrachoblanco is used for the treatment of impotence (Pereira 2007), which can also be chemically verified due to its vasodilatory properties (Oliveira et al, 2009). Furthermore, *Aspidosperma subicanum*, known as guatambu, is popularly used to treat diabetes (Almeida et al, 2019), and this use is considered to be effective by certain scientific studies (Oliveira et al, 2009).

Finally, no studies that demonstrate the pharmaceutical or the cosmetic properties of the species *A. pyrifolium* were found. Here lies a limitation of this research, which collected these scientific studies from information available at online open access journals and databases. Once the codification is carried out, it is worth mentioning that the laboratory verifications of the properties of *Aspidosperma sp*. may indicate the incorporation of traditional knowledge by the objectivity of the natural sciences and the modern scientific rationality, described by Quijano (2000), which reveals the coloniality of knowledge and power.

Taking into account the data in Table 2, it is possible to compare the descriptions of the patents collected in Table 1. As Glaser and Strauss (2017) propose, regardless of the data set handled by researchers, comparative methods are constantly used. Therefore, the goal is to observe whether in the patent application there was a relationship between the traditional uses and their properties. Table 3, where the codifications of *Aspidosperma*'s uses, related to the descriptions of Table 2, are highlighted, constitutes a relevant result for the categorization process.

Moreover, it is important to recall the question that supports this research, that is, whether the internationally adopted patent legal system facilitates a possible appropriation of

natural genetic resources of Brazilian biodiversity and associated traditional knowledge, thus reinforcing the colonial logic of domination of central countries over peripheral countries.

In fact, there is a certain correspondence between the use of *Aspidosperma* by traditional communities and patent holders, considering that the five remaining inventions have significant similarities between the description of the patent in the *patentscope* database and the traditional use applied to one of the species of *Aspidosperma*. These similarities may suggest an appropriation of traditional knowledge authorized by the patent legal system. As Quijano (2000) demonstrates, colonialism is expressed not only through economic domination, but also through the control of knowledge. Thus, the traditional knowledge passed down from generation to generation about *Aspidosperma sp.* which constitutes the identity of a people (Diegues, 2008), is absorbed by the modern and rationalist system of colonial matrix that use this knowledge to constitute legally permitted monopolies of exclusivity.

Other relevant questions to be raised concern the initial proposed questions of the research, according to Charmaz (2009, p. 63): "Did the participants provide sufficient information to make plausible interpretations? And do we have enough knowledge of the relevant areas to read and understand your words?" The patentscope database provides the description of patents, but the technical language, impregnated with mathematical, chemical and natural sciences knowledge in general, does not allow broad and unrestricted cognitive access to its transcriptions by laypeople, which reinforces the scientific rational dynamics of modernity. Although, in the case, there is the criterion of the publicity of the administrative acts registered in the patent legal system, access to the documents themselves does not mean a full understanding of the contents contained in each of the applications registered there. As a matter of fact, it is a hard task, permeated by relative uncertainty, to identify and codify the traditional uses of the natural resource in question and correlating them with the description of inventions. Depending on the complexity of the technical contents of patent applications, and understanding the relationship between these two distinct worlds, i.e., that of science and that of the traditional, significant empirical evidence for the construction of a theory of the appropriation of the traditional by the patent legal system is unveiled. Finally, it is not a simple nuisance caused by the existence of biopiracy, as exposed and denounced by Shiva (1997),

but rather an empirical finding of significant relationships between what was actually granted as a patent for invention and what is actually practiced in traditional communities.

According to Diegues (2008), the social sciences are practically absent in programs that study the global changes in the biosphere that are dominated by meteorology, biology, climatology, oceanography, among others, and biodiversity also belongs to the cultural realm as well as to the natural. From this perspective, the selected patents demonstrate the rationality of the natural sciences, dominated by laboratories and multinational companies, away from traditional populations, largely responsible for maintaining biological diversity (Diegues, 2008).

Finally, regarding the last part of the proposed research question, that is, whether there is a possible configuration of a process of appropriation of the knowledge and the traditional practices of peripheral countries by the central countries, it is possible to affirmatively confirm it, taking into account the theoretical assumptions, elaborated by Mignolo (2008) and Quijano (2000). The data collected and organized in Table 1 demonstrates that all the places designated to receive the patent application and thus granted the invention, such as, France, the United States, Canada and the European Patent Office, are located in the north of the globe. These offices were efficient and responsive in granting patents derived from traditional use, although in none of them, this type of knowledge and use of the *Carapanaúba* plant can be found.

Taking all the aforementioned conclusions into consideration, there is no doubt that there may be a significant distortion of the parameters of novelty and inventiveness, legal requirements for the granting of a patent. Barbosa's question (2015, p. 23): "how much human intervention will need, for novelty to exist, as a detached solution of the product or natural phenomenon?", can be slightly reformulated, from this initial empirical study, that is, how much rationalist scientific intervention is needed for novelty to exist as something distinct from traditional knowledge? Thinking about this question means going beyond the legalistic limits imposed by developed countries on developing countries and thinking about intellectual property from a new perspective. In this sense, Chang's (2001) approach is relevant when he criticizes the rigidity of the legal imposition of TRIPS (Trade Related Intellectual Property

Rights Agreement) by developed countries to developing countries in open dissonance to what the latter actually accomplished when at the beginning of their industrialization processes. All these elements serve to reinforce the idea of colonial domination denounced by Mignolo (2008), for the Carapanaúba plant has its origin in southern countries which are constantly harmed by the legalistic dynamics of the intellectual property system at the international level.

5. Final remarks

The aim of this research was to understand whether the appropriation of traditional knowledge associated with the biodiversity of South American countries is somehow authorized by the patent legal system. The genus *Aspidosperma sp.*, found in tree bark in several regions of South America, is used in different ways by traditional communities scattered throughout the continent. Through the WIPO database, patentscope, it was possible to withdraw information about patents involving *Aspidosperma sp.* in its description, resulting in a selection of those who actually used the resource in their process or invention. A review of specific literature was carried out to find the traditional uses of this genus, as well as its chemical properties.

Through the methodological tools of the rules of inference and the grounded theory, the description of patents was compared to the traditional use of the genus and its properties to understand whether there was indeed a relationship between traditional knowledge and internationally protected inventions. Five patent applications granted by developed countries were found, which incorporate this knowledge. In fact, this serves as an indication that the patent system can help in the overlapping of knowledge and practices stemming from traditional communities, thus evidencing a possible relationship of appropriation and coloniality of knowledge and power of developed countries over developing countries.

Finally, this case study is part of a long-term project whose objective is to accumulate multiple case studies in order to base the theory preliminary exposed here in order to achieve, in the future, a more consistent theoretical generalization.

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