http://doi.org/10.14393/ER-v30a2023-19

Intellectual Property in Biotechnology courses at Federal Universities in Brazil[1]

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ABSTRACT

This study aimed to identify the offer of the Intellectual Property (IP) discipline in the Pedagogical Projects of Courses (PPC), as well as the period, workload, and syllabi of the disciplines of Biotechnology courses at federal universities in Brazil. In this descriptive research, through document and content analysis, a search was made for PPC and syllabi on the pages of institutions that offer Biotechnology courses at federal universities in Brazil. In the analyses carried out, it was found that subjects such as patents, entrepreneurship, management, and creation of projects, as well as intellectual property itself, are mentioned more frequently in the analyzed menus.

KEYWORDS: Higher Education; Syllabi; Course Pedagogical Projects.

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Propriedade Intelectual nos cursos de Biotecnologia das Universidades Federais do Brasil

RESUMO

Este estudo objetivou identificar a oferta da disciplina Propriedade Intelectual (PI) nos Projetos Pedagógicos de Cursos (PPC), bem como o período, carga-horária e ementas das disciplinas dos cursos de Biotecnologia de universidades federais do Brasil. Nesta pesquisa de caráter descritivo, por meio de análise documental e de conteúdo, foi realizada a busca dos PPC e das ementas nas páginas das instituições que ofertam os cursos de Biotecnologia nas universidades federais brasileiras. Nas análises realizadas, constatou-se que assuntos como patentes, empreendedorismo, gestão e criação de projetos, bem como a propriedade intelectual propriamente dita, são mencionados com mais frequência nas ementas analisadas.

PALAVRAS-CHAVE: Ensino Superior; Ementas; Projetos Pedagógicos de Cursos.

Cursos de Propiedad Intelectual en Biotecnología en Universidades Federales de Brasil

RESUMEN

Este estudio tuvo como objetivo identificar la oferta de la disciplina Propiedad Intelectual (PI) en los Proyectos Pedagógicos de Cursos (PPC), así como el período, la carga horaria y los programas de las disciplinas de los cursos de Biotecnología en las universidades federales de Brasil. En esta investigación descriptiva, a través del análisis de documentos y contenido, se realizó una búsqueda de PPC y programas en las páginas de las instituciones que ofrecen cursos de Biotecnología en las universidades federales de Brasil. En los análisis realizados se encontró que temas como patentes, emprendimiento, gestión y creación de proyectos, así como la propia propiedad intelectual, son mencionados con mayor frecuencia en los menús analizados.

PALABRAS CLAVE: Enseñanza Superior; Programas; Curso Proyectos Pedagógicos.

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Introduction

Historically, humanity has needed to manipulate and modify the materials available in nature, giving them new improvements to be used in the most diverse ways, all to satisfy and meet their primordial needs. As a result, these experiments enabled the development of technologies and/or intellectual creations encompassing various sectors and areas of knowledge (BACELAR et al., 2022).

With the passage of time and the arrival of print media, the need for protection became even more essential, since the possibility of reproducing ideas in print became commonplace, as did biopiracy and plagiarism. Thus, with the consolidation of this scenario, man was forced to create ways to protect the knowledge and experiences acquired, and it was this need to protect the respective creative expressions of man that gave rise to Intellectual Property (IP) (BIAGIOTTI, 2016; BACELAR et al., 2022). Thus, IP came about as a way of ensuring protection against unfair competition and all other rights inherent to intellectual activity in the industrial, scientific, literary, and artistic fields.

According to the World Intellectual Property Organization (WIPO) Convention, IP is

> the sum of the rights relating to literary, artistic, and scientific works, interpretations by performers and executions by performers, phonograms, and broadcasts, inventions in all fields of human activity, scientific discoveries, industrial designs, industrial, commercial, and service marks, as well as trade names and commercial names, protection against unfair competition and all other rights inherent in intellectual activity in the industrial, scientific, literary and artistic fields (WIPO, 2022).

IP is regulated by various international treaties, such as the Berne Convention on copyright, the Paris Convention on industrial property, and other agreements such as TRIPS (Trade-Related Aspects of Intellectual Property Rights), with each country having its legislation in this area. In Brazil, IP is one of the rights guaranteed by law since its first constitution, the Political Constitution of the Empire of Brazil or the Constitution of 1824. The Constitution of the Federative Republic of Brazil of 1988 also provided guarantees for IP, as mentioned in Art. 5, in its sections XXVII to XXIX

> Art. 5 Everyone is equal before the law, without distinction of any kind, and Brazilians and foreigners residing in the country are guaranteed the inviolability of the right to life, liberty, equality, security, and property [...]". XXVII - Authors shall have the exclusive right to use, publish, or reproduce their works, transferable to their heirs for as long as the law shall determine. XXVIII - under the terms of the law, the following are guaranteed: a) protection for individual participation in collective works and the reproduction of the human image and voice, including in sporting activities; b) the right to inspect the economic use of the works they create or in which they participate for creators, performers and their respective union and association representations. XXIX - the law shall guarantee the authors of industrial inventions a temporary privilege for their use, as well as protection for industrial creations, trademark ownership, company names, and other distinctive signs, with a view to the social interest and the country's technological and economic development (BRASIL, 1988).

Subsequently, other laws and public policies were implemented to promote and regulate IP in Brazil. Currently, Brazilian IP is governed by several laws, such as Law No. 9.279, of May 14, 1996, which

regulates industrial property rights and obligations (BRASIL, 1996); Law No. 9.456, of April 25, 1997, which institutes the protection of cultivars (BRASIL, 1997); Law No. 9.609, of February 19, 1998, which provides for the protection of intellectual property in computer programs (BRASIL, 1998 a); Law No. 9. 610, of February 19, 1998, which consolidates copyright legislation (BRASIL, 1998 b). 610, of February 19, 1998, which consolidates copyright legislation (BRASIL, 1998 b); Law No. 11,484, of May 31, 2007, which provides for incentives for integrated circuit topographies (BRASIL, 2007) and Law No. 13,123, of May 20, 2015, which provides for associated traditional knowledge (BRASIL, 2015).

Knowledge of IP and its regulations ensures the recognition, protection, and financial return of IP assets and avoids, for example, infringements of third-party rights. Based on this principle, the discussion about the protection of rights over creations and works stemming from the human intellect should receive greater attention in teaching and research institutions as they are the foundations of humanity's knowledge (BACELAR et al., 2022).

Given the above, it is crucial to include IP content in basic education. In Higher Education, IP is an area of great relevance in general and particularly in courses such as Biotechnology, as according to the Organization for Economic Cooperation and Development (OECD), it refers to the "application of science and technology to living organisms, as well as their parts, products, and models, to alter living or non-living materials for the production of knowledge, goods and services" (OECD, 2005, p. 9).

Considering the great potential of biotechnology for improving Brazil's Science, Technology, and Innovation (S, T&I) indicators, IP ensures protection for any forms of creation, processes, and discoveries arising from this area. Based on this assumption, the premise of offering the subject of IP in Biotechnology courses is something of great value, since it would be

entirely linked to the training of professionals able to enter the job market, giving them skills capable of providing them with the knowledge to deal with issues of this nature.

Based on the relevance of IP for the training of biotechnologists, the objectives of this study were to present the panorama of the curricular insertion of the subject of IP in graduate courses in Biotechnology at federal universities in Brazil and to analyze the theoretical lines that underpin teaching and the predominant themes in this approach.

Material and methods

This is a qualitative-quantitative study. In terms of objectives, it is exploratory and descriptive, based on a theoretical reflection on the subject based on documentary research into the curricula and syllabuses of Intellectual Property in graduate courses in Biotechnology at 20 federal universities in Brazil.

The qualitative-quantitative research approach, according to Knechtel (2014, p. 106), "[...] interprets quantitative information through numerical symbols and qualitative data through observation, participatory interaction and interpretation of the subjects' discourse (semantics)". According to Moraes (2015, p. 22), exploratory studies "provide greater familiarity with the problem, to make it explicit or construct it" and descriptive studies "describe the characteristics of a particular population/phenomenon or establish relationships between variables". In turn, the documentary study "corresponds to the investigation of internal or external documents of institutions" (SILVA, 2015, p. 58).

The procedure adopted in the documentary research consisted of researching the curricula and syllabuses of the subjects of interest by consulting the websites of the 20 federal universities in Brazil that offer Biotechnology courses. The process of obtaining and analyzing curricula and

syllabi was extended to all campuses of the same institution, as there may be differences between campuses in terms of the Biotechnology curricula at the same institution.

After collecting the data, the curricula were analyzed for the existence of the subject of Intellectual Property (IP), containing terms related to IP in its wording or syllabus. In the analysis, the type of biotechnology course was broken down (bachelor's degree or technologist), as well as their shift (daytime/full-time or evening). The nature of the subjects was also broken down, i.e. whether they were compulsory or optional/elective, the period offered, the workload, and the name of the subject. The syllabus was analyzed to assess the theoretical lines that framed the teaching of the subject, as well as to identify the predominant themes.

The answers given by the students from the evaluation activity were organized and analyzed using content analysis, which is a method for analyzing data from qualitative research. This analysis makes it possible to understand and explore the content of the participants' answers, and thus make inferences about the information obtained from the answers (BARDIN, 2011). Some data was also quantified and presented in percentages.

This study was carried out in four stages. In the first stage, a survey was carried out of the Brazilian federal universities offering Biotechnology courses in the National Register of Higher Education Courses and Institutions - Cadastro e-MEC (https://emec.mec.gov.br/emec/nova). Next, the PPCs and syllabuses of the Biotechnology courses at the selected universities were checked on their websites.

In the third stage, a preliminary analysis of the contents of these official curricular documents was carried out, with special attention to identifying the IP subject. At this stage, information such as the names of the institutions, campuses, and municipalities offering biotechnology courses, periods, and workloads of the IP subject was selected. The

process of obtaining and analyzing curricula and syllabuses was extended to all campuses of the same institution, as there may be differences between campuses in terms of the Biotechnology curricula at the same institution.

Finally, in the fourth stage, and after selecting the official curricular documents that fit the study's objective, a qualitative analysis of the data from the IP subject syllabuses of the selected institutions was carried out. Based on this systematization via content analysis, the following category of analysis was generated: a) What do the syllabuses of the Biotechnology courses at the federal universities say about IP?

Content analysis makes it possible to understand and explore the content of the participants' answers, and thus make inferences about the information obtained from the answers (BARDIN, 2011). Some of the data was also quantified and presented in percentages. In the analysis, the type of biotechnology course was broken down (bachelor's degree or technologist), as well as their shift (daytime/full-time or evening). The nature of the course was also broken down, i.e. whether the subjects were compulsory or optional/elective, the period offered, the workload, and the name of the subject. The syllabus was analyzed to assess the theoretical lines that framed the teaching of the subject, as well as to identify the predominant themes.

Results and discussion

Of the 69 federal universities in Brazil, 28.9% (n = 20) offer Biotechnology courses. Of these, 30% (n = 6) are at federal universities in the southeast, 20% (n = 4) in the south and northeast, and 15% (n = 3) at universities in the center-west and north, respectively, with the course being offered in more than one municipality in the same state and university in some of the institutions (Chart 1).

Chart 1: Information on the federal universities in Brazil that offer the Biotechnology course.

Region	Federal Units	Federal Universities	Acronyms	Municipalities
North	Amazonas	Universidade Federal do Amazonas	UFAM	Coari
				Manaus
	Pará	Universidade Federal do Pará	UFPA	Belém
		Universidade Federal do Oeste do Pará	UFOPA	Santarém
Northeast	Bahia	Universidade Federal da Bahia	UFBA	Salvador
				Vitória da Conquista
	Ceará	Universidade Federal do Ceará	UFC	Fortaleza
	Paraíba	Universidade Federal da Paraíba	UFPB	João Pessoa
	Rio Grande do Norte	Universidade Federal Rural do Semi-Árido	UFERSA	Mossoró
Center West	Distrito Federal	Universidade de Brasília	UnB	Brasília
	Goiás	Universidade Federal de Goiás	UFG	Goiânia
	Mato Grosso do Sul	Universidade Federal da Grande Dourados	UFGD	Dourados
South East	Minas Gerais	Universidade Federal de Alfenas	UNIFAL	Alfenas
		Universidade Federal de Uberlândia	UFU	Patos de Minas
				Uberlândia
		Universidade Federal de São João del Rei	UFSJ	São João del Rei
	São Paulo	Fundação Universidade Federal do ABC	UFABC	Santo André
		Universidade Federal de São Carlos	UFSCar	Araras
				São Carlos
		Universidade Federal de São Paulo	UNIFESP	São José dos Campos
South	Paraná	Universidade Federal da Integração Latino-America	UNILA	Foz do Iguaçu
	Rio Grande do Sul	Universidade Federal do Pampa	UNIPAMPA	São Gabriel
		Universidade Federal de Pelotas	UFPel	Capão do Leão
		Universidade Federal do Rio Grande do Sul	UFRGS	Porto Alegre

Source: Prepared by the authors (2022).

About shift, 83.3% (n = 20) of the Biotechnology courses at Brazilian federal universities offer full-time courses, the majority of which are bachelor's degrees (95.8%, n = 23). The IP subject is offered in

29.2% (n = 7) of the Biotechnology courses at federal universities in the 7th term and 20.8% (n = 5) in the 6th term. Only 4.2% (n = 1) offer the subject in the last period of the course, specifically in the 10th. The IP subject is offered as a compulsory subject in 87.5% (n = 21) of the courses, mostly with a workload of 30 hours (33.3%, n = 8), with some courses offering 60 hours (16.6%, n = 4) (Chart 2).

Given this data, it can be seen that there is no consensus between federal institutions and biotechnology courses regarding the period and workload of this subject.

Concerning the names of the IP subjects in the Biotechnology courses at Brazil's federal universities, it can be seen that the majority (29.2%, n = 7) of the subjects have Entrepreneurship in their name, followed by a more law-oriented strand (Legislation), with 20.8% (n = 5) of the subjects and Innovation in 16.7% (n = 4) of the IP subjects (Chart 2).

http://doi.org/10.14393/ER-v30a2023-19

Chart 2: Shift, modality, period, workload, name, and syllabus of the IP subjects in the Biotechnology courses at Brazil's federal universities.

Acronyms	Municipalities	Shifts	Modalities	Periods	HL	Name of subjects	Quotes
UFAM	Coari	Full time	Bachelor	3rd	30h	Intellectual Property	The main biotechnological routes. Biotechnological prospecting and knowledge management. Innovation and intellectual property. Industrial property: patents, trademarks, and industrial designs. Biotechnology patents, comparison of legislation in different countries. Protection by breeders' rights, legislation on the protection of cultivars. Examples of intellectual protection granted in the biological area and existing conflicts
UFAM	Manaus	Evening	Technologist	6th	30h	Innovation and Intellectual Property in Biotechnology	The main biotechnological routes. Biotechnological prospecting and knowledge management. Innovation and intellectual property. Industrial property: patents, trademarks, and industrial designs. Biotechnology patents, comparison of legislation in different countries. Protection by breeders' rights, legislation on the protection of cultivars. Examples of intellectual protection granted in the biological area and existing conflicts
UFPA	Belém	Afternoon	Bachelor	6th	90h	Patents and Intellectual Property, Entrepreneurship in Biotechnology	Fundamentals and importance of patents. Industrial property. Innovation systems. Biotechnology patents. Access to genetic heritage. The market. Standards, relevant legislation, treaties and conventions. Searching patent databases. Drafting a patent application

UFOPA	Santarém	Full time	Bachelor	10th	45h	Entrepreneurship and Patents	Entrepreneurship; characteristics; opportunities; developing entrepreneurial attitudes. New Paradigms. Managing company growth. Business prospecting. Business plans. Innovation and creativity. Organizational modeling. Market research. Sales techniques. Negotiation techniques. Quality. Price formation. Management tools. Fundamental concepts. Historical and legislative developments. Patents and biotechnology. International organizations in the field of intellectual property. The trademark protection system at the national and international level. The administrative process for obtaining a patent. Extension of patent rights. Patent search mechanisms
UFBA	Salvador	Evening	Bachelor	5th	34h	Technological Innovation and Intellectual Property	To promote regional capacities based on the application of biotechnology combined with knowledge of chemical and biological processes for the planning, development, and management of technologies and production systems to improve quality of life and technological development. To train students in the legal understanding of specialized fields of law with implications for biotechnology. Intellectual property laws. To enable students to integrate the technical dimensions of decisions in Biotechnology, given the legal restrictions and opportunities in current legal codes.
	Vitória da Conquista	Full time	Bachelor	9th	68h	Technological Innovation and Intellectual Property	Intellectual property; basic concepts; the concept of trademarks and patents; Brazilian legislation; the Brazilian intellectual property system - structure and operation; the trademark registration process; the patent registration process; technology transfer; the international intellectual property system - the TRIPS agreement; Intellectual property and international trade; trends in the evolution of intellectual property

UFC	Fortaleza	Full time	Bachelor	5th	32h	Projects and Patents	Presentation of the National Science and Technology System. Current government guidelines and policies (federal and state). Research funding agencies. The legal nature and way in which FINEP, CNPq, and other funding agencies operate. Analysis of current calls for proposals and their results. Legislation on access to genetic heritage. Sectoral funds. Drafting, filing, granting, and reformulating patents. Patent banks
UFPB	João Pessoa	Full time	Bachelor	7th	30h	Intellectual Property Protection	Patent drafting, the nature of intellectual property rights, technology transfer, financing innovation, technological prospecting studies, copyright, contextualizing intellectual property as a development strategy
UFERSA	Mossoró	Full time	Bachelor	7th	60h	Legal Frameworks in Biotechnology and Patents	Innovation Law, Science and Technology Institutions (ICT), innovation process in the light of Law 10.973/2004, types of protection, protection of knowledge, intellectual protection x industrial protection, general concepts: trademarks, industrial design, protection of cultivars, software, geographical indication, patents: patent of invention, certificate of addition, utility model, ownership, patent licensing, databases, international patent classification, patent status, patent family, patent banks for prospecting in biotechnology
UnB	Brasília	Full time	Bachelor	7th	30h	Legislation, Patents and Intellectual Property	Intellectual Property: explore concepts and modalities, technological prospecting, legal systems, and IP regulatory frameworks. Legal framework: explore aspects for filing in the area of Biotechnology: filing of microorganisms, genetic sequence listing, and other relevant aspects on biopharmaceuticals, international treaties, technology transfers, synthetic biology, and bioethics fundamentals. Patents: developing search activities and patent drafting techniques.

http://doi.org/10.14393/ER-v30a2023-19

UFG	Goiânia	Full time	Bachelor	7th	32h	Biotechnology Legislation - Patent/Intellectual Property	Introduction to intellectual property. Types of patents. Notions of patent drafting. International patent agreements. Legal and regulatory frameworks for patents. Copyright law. Patent legislation. Technology transfer
UFGD	Dourados	Full time	Bachelor	6th	36h	Law and Intellectual Property	Nature of intellectual property rights. Other distinctive signs. Contextualization of intellectual property as a development strategy. Industrial property. Patents. Copyright. Author's moral right. Author's property rights. Related rights. Piracy
UNIFAL-MG	Alfenas	Full time	Bachelor	4th	30h	Intellectual Property in Biotechnology	Intellectual property and industrial property. Industrial property system. Biotechnology patents (Law 9279/96). Drafting, classifying, searching, and filing patents. Requirements for patenting a new candidate drug. Product development based on patents filed. The university/company relationship in making patents viable. Technical and economic feasibility study. Innovation Law (10973/04) in the context of intellectual property in Biotechnology
UFU	Patos de Minas	Full time	Bachelor	6th	60h	Entrepreneurship and Idea Generation	The exploration of ideas and business opportunities; the entrepreneur's profile; and environments that influence the entrepreneur's success. Entrepreneurship as a process. Dimensions for identifying sectors favorable to new businesses. Development of creative thinking. Creative destruction: the genesis of entrepreneurship
UFU	Uberlândia	Full time	Bachelor	6th	30h	Innovation and Industrial Property	Fundamentals of industrial property in biotechnology. Patents in biotechnology and protection of cultivars. National and international legislation. Registration and processes. Man and technical creations. Novelty, originality, and utility. Industrial inventions, utility models, and industrial designs. Forms and content. Trademarks and patents. Distinctive criteria. Registration. Obtaining. Procedure. Legal repercussions. The technical inventor, his rights and duties. Legal and administrative protection instruments for industrial property. International protection

UFSJ	São João del Rei	Full time	Bachelor	O	72h	Intellectual Property, Entrepreneurship, and Innovation in Biotechnology	Fundamentals of the relationship between scientific research processes in biotechnology and the market for products and processes. Market models and opportunities in biotechnology. Technological development in Brazil. Technological Innovation Law and structures for intellectual development and protection. Entrepreneurship. Patents. Biotechnology management system. Health legislation for setting up biotech companies. Business incubators. CNTBio. Fundamentals for a business implementation plan. Drawing up a business plan to analyze the viability of an opportunity in biotechnology.
UFABC	Santo André	Morning and Evening	Bachelor	NI	60h	Entrepreneurship and project planning in Biotechnology	Provide an overview of the stages of construction and execution of projects in Biotechnology
UFSCar	Araras	Full time	Bachelor	NI	SI	NI	NI
UFSCar	São Carlos	Full time	Bachelor	7th	30h	New ventures	Introduction to the development of new ventures (history and conceptualization). The process of creating a company. Success and failure factors in starting a business. Business plans. Technology transfer. Technology-based companies. Case studies
UNIFESP	São José dos Campos	Full time	Bachelor	5th	36h	Entrepreneurship in Biotechnology	Introduction to business administration concepts. Bases for designing new businesses in Biotechnology. Technical and financial feasibility studies, valuation techniques, and the development of biotechnology business plans. University/institute/company interaction. Strategic management of technology and innovation. Intellectual property

UNILA	Foz do Iguaçu	Full time	Bachelor	7th	34h	Intellectual Property	Fundamentals of intellectual property in biotechnology. Patents in biotechnology and protection of cultivars. National and international legislation. Registration and processes. Man and technical creations. Novelty, originality, and utility. Industrial inventions, utility models, and industrial designs. Forms and content. Trademarks and patents. Distinctive criteria. Registration. Obtaining. Procedure. Legal repercussions. The technical inventor, his rights and duties. Legal and administrative protection instruments for Industrial Property. International protection
UNIPAMPA	São Gabriel	Full time	Bachelor	O	45h	Introduction to Intellectual Property	The importance of material goods, their relevance to the phenomenon of globalization in the information age, and the awakening to the emergence of the knowledge society
UFPel	Capão do Leão	Full time	Bachelor	7th	30h	Biotechnology legislation	Legal bases related to the application of biotechnology processes and products and national and international legislation. Notions of innovation and protection of intellectual capital, registration of patents for biotechnological products and processes. Characteristics of innovation in research institutes. Identification of local and national opportunities for the development of biotechnology products and processes. New paradigms based on the Innovation Law. Patent registration. Creating a patent application. Advice on the registration project. Legal issues and legal tools to promote innovation
UFRGS	Porto Alegre	Full time	Bachelor	O	60h	Management and Patents in Biotechnology	SI

Source: Prepared by the authors (2022). Legend: WL - workload, O - optional, NI - no information.

Based on an analysis of the syllabuses, it can be seen that students on Biotechnology courses at Brazilian federal universities will have information on national and international standards, legislation, treaties and conventions, biotechnology prospecting, entrepreneurship, innovation, S&T&I funding agencies, bodies that promote this field in Brazil and elsewhere in the world, industrial property, copyright, and sui generis protection. In addition, they will have contact with intellectual protection aimed particularly at Biotechnology, as well as searching for patents in the area in public banks such as the INPI, as well as writing a patent letter.

IP teaching was initially offered in law courses, with knowledge focused on the area and its professionals (GIMENEZ et al., 2012). Thus, the fact that IP is offered in 19 biotechnology courses at federal universities in Brazil (only one institution was unable to obtain information on its offer) is a pertinent finding. After all, IP is crucial for the economic and social development of a nation, and is even important in increasing competitiveness (SICHEl, 2020), which is in line with Article 2 of Decree No. 10.886, of December 7, 2021, which established the National Intellectual Property Strategy (ENPI) (BRASIL, 2021):

> Art. 2 ENPI's guidelines are I - the use of intellectual property as a way of adding value to products and services and as an incentive to innovation, creation, and knowledge; II - the strategic use of intellectual property in public policies, to encourage competitiveness and economic, technological and social development (BRASIL, 2021).

About teaching, axis 2 of Decree No. 10.886/2021 highlights the importance of "[...] evaluating the possibility of including IP as a compulsory or optional subject in graduate courses to disseminate to the academic community the strategic and commercial value of the subject [...]" (BRASIL, 2021).

In Brazil, Higher Education Institutions (HEIs) play an important educational, scientific, extension, and technological role, and are responsible for a large part of the IP registrations filed with the INPI, being well placed in the 2020 Ranking of Resident Depositors (INPI, 2021).

These facts reinforce the importance of student qualification in the area of IP, which will further leverage scientific, technological, and innovation development in Brazil, particularly in Biotechnology as it is a transdisciplinary area that involves sectors such as agriculture, livestock, industry, energy, food, the environment and health (BATTEZINI et al., 2018). It is worth noting that this area has contributed to the development of, for example, more disease-resistant plant varieties, foods with greater nutritional value, early diagnosis of diseases, and the development of vaccines, which contributes to actions that benefit society and the environment in general (LOUREIRO et al., 2012).

Thus, with the broad and specialized training that professionals in the field of Biotechnology receive, as well as the whole horizon of events arising from the teaching of IP in their graduate courses, they will be able to form a professional who is competent in their area of work and who will have a keener eye for issues in this specific area. Thus, learning content related to intellectual property, entrepreneurship, and innovation is essential for preparing critical individuals who are active in society, both personally and professionally.

Conclusion

The research revealed that the panorama of curricular insertion of IP in the graduate courses in Biotechnology at federal universities in Brazil can help the students of these courses to have an expanded knowledge of the fundamentals and specificities of the biotechnology area, such as, for example, innovation, patents, legislation, among many others, identified in the menus analyzed.

The research also showed that the Intellectual Property subject offered at the universities surveyed can provide students with a little more knowledge about national and international regulations relating to IP and S, T&I, which is important for enhancing their understanding of intellectual protection.

The data also showed that the theoretical lines underpinning the teaching and the predominant themes in this approach concern both intellectual property and innovation and entrepreneurship. This is important, as it can provide students with a range of IP knowledge options that can be used in their professional careers, as well as in scientific research, both at undergraduate and postgraduate levels.

Given this, it is hoped that the data from this study can contribute to further research into IP in graduate courses in Biotechnology in the country since there are still few studies on this topic in the Brazilian scientific literature

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Received in February 2023.

Approved in September 2023.