

## Patenting in the cosmetic sector: study of the use of herbal extracts

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The aim of this work was to evaluate the innovative performance of herbal extracts applied in cosmetics area, based on information collected from Brazilian, American and European patent banks. Analysis were carried out to evaluate the number of patent deposits from each database, the patent applicants profiles, the companies with most patent applications, and also the main uses of herbal extracts in cosmetics. Based on the results achieved, the number of patents filed at the Brazilian patent bank is much lower than that observed in American and European patent banks. Although the number of patents is limited, the analysis indicated a range of cosmetic applications that acts according to the international market trend, represented by a large number of multifunctional products.

**Uniterms:** Cosmetics/patenting. Plant extract/use in cosmetics.

O objetivo deste trabalho foi avaliar o cenário da inovação referente a extratos vegetais aplicados no setor de cosméticos, com base em informações extraídas dos bancos de patentes brasileiro, americano e europeu. Foram realizadas análises para avaliar o número de depósitos de patentes de cada banco de dados, o perfil dos depositantes, as empresas com maior número de registros de patentes, e também as principais aplicações dos extratos vegetais descritos nos documentos. Com base nos resultados obtidos, o número de patentes depositadas no banco de patentes brasileiro é muito inferior ao observado nos bancos de patentes americano e europeu. No entanto, embora o número de patentes seja limitado, as análises indicaram uma variedade de aplicações cosméticas que agem de acordo com a tendência do mercado internacional, representada por um número elevado de produtos multifuncionais.

**Unitermos:** Cosméticos/patentes. Extrato vegetal/uso em cosméticos.

### INTRODUCTION

Much of the planet's biodiversity is concentrated in developing countries. It is estimated that 70% of the world's biodiversity is located in 17 countries considered megadiverse (Fazey, Fischer, Lindenmayer, 2005). As a member of this group, Brazil is considered the most biologically diverse country and is estimated to have from 10 to 20% of the total number of species on the planet (Dias, 2002).

Given the inherent economic potential in the exploi-

tation of natural resources in the ecosystem, herbal extracts have been used by cosmetic science in order to beautify and maintain the physiological balance of the human skin. A number of plant products described in scientific literature shows distinct activities on the skin, such as moisturizing (Futrakul, Kanlayavattanukul, Krisdaphong, 2010; Akhtar *et al.*, 2011), antioxidant (Seo *et al.*, 2010; Jorge *et al.*, 2011), sunscreen (Kale *et al.*, 2010a; Kale *et al.*, 2010b) and depigmentation (Costa *et al.*, 2010; Nguyen, Lee, Kim, 2011).

The development of products with high amounts of plant components is characterized as a market trend in cosmetics and perfumery. This fact is a result of both the consumer search for natural products with proven effectiveness as well as the economic interest of the industry

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for such components. The desirable features of cosmetic ingredients are efficacy, safety, novelty, formulation stability, easy metabolism in skin, and low cost, which has increased the demand and use of herbal cosmetics (Kurata, 1994; Ashawat *et al.*, 2009). Furthermore, compared to synthetic cosmetic products, herbal products are mild and biodegradable, besides having a low toxicity profile (Chanchal, Swarnlata, 2008).

In this context, the issue of intellectual property deserves special attention, particularly considering the recent concern of Brazilian institutions about the theme (Calixto, 2003). The most widespread form of protection of innovations is patents, which are a legal mechanism of intellectual protection, classically and internationally accepted (Haase, Araújo, Dias, 2005).

However, it is vital to understand that not all search results may get protection by the patent system. As provided in Article 8 of Law 9279 of May 14, 1996 (Law of Industrial Property - LPI): "To be patentable, an invention must meet the requirements of novelty, inventive activity and industrial application". Furthermore, with regard to protection of biological resources by the patent system, it is first necessary to distinguish between the concepts of invention and discovery.

Discovery is not the result of man's creation: , through observation and analysis, he only verifies the existence of something not previously noticed. In contrast, invention contemplates human creativity (Kunisawa, 2005).

Thus, plants or any substance extracted from them are not patentable, as provided for in Law 9279/96, Article 10, section IX: "It is not considered an invention or utility model: [...] IX - the whole or part of natural living beings and biological materials found in nature, or isolated from it". However, compositions containing plant extracts or isolated molecules may be patented if they have any application (Moreira, Antunes, Pereira Jr, 2004). As an example, the root extract of *Pothomorphe umbellata* (popularly known as pariparoba), a shrub native to the Atlantic biomes, has been patented for pharmaceutical and cosmetic applications, because of its anti-aging and photoprotective activities (Biavatti *et al.*, 2007).

Due to the misappropriation of Brazil's biodiversity through a process called biopiracy, measures were created to contain the spread of this practice. Cases of biopiracy erupted in several countries, drawing attention to the need for specific legislation protecting traditional knowledge, regulating access of rich countries on developing countries, establishing a system of technology transfer, and also socializing resources from traditional communities (Heringer, 2007). Genetic Heritage Management Council

(CGEN) resolution no. 34/2009 provides, in its Article 2, that "for purposes of demonstrating compliance with the provisions of Provisional Measure No. 2186-16 of 2001, the applicant for the invention patent request, whose object has been obtained as a result of access to samples of components of national genetic heritage, effected as of June 30, 2000, must inform the National Institute of Industrial Property (INPI) about the origin of genetic material and associated traditional knowledge".

This study aimed to conduct a survey on the profile of patents involving cosmetic applications containing plant extracts, based on information collected from different patent databases, due to the richness of Brazilian biodiversity and the fact that patents are a key indicator of innovation.

## METHODS

The National Institute of Industrial Property (INPI, 2010), United States Patent and Trademark Office (USPTO, 2010) and European Patent Organization (EPO, 2010) patent banks were used as data source. Documents were selected by presenting in the abstract and/or title the keywords "extrato", "cosmético", "extract" and "cosmetic", as well as their variations and combinations. Only the patent applications that had at least one plant extract were analyzed, and different nature extracts (fungi, bacteria, etc) were excluded. The prospective study was performed with a volume of patents issued since 1976 (USPTO), 1978 (EPO) and 1982 (INPI), until March 2009.

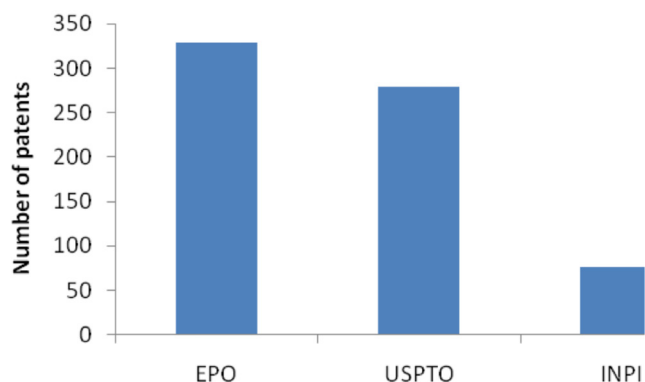
In this survey, the following analyses were carried out: 1) Quantification of patent applications in each of the databases. 2) Evolution of the number of patent deposits made in Brazil over the years. 3) INPI and EPO databases profile of patent applicants. 4) Main business patent applicants in Brazil. 5) Determination of the main applications of herbal extracts in the cosmetic area.

## RESULTS AND DISCUSSION

### Databases patents quantification

The results showed that the amount of patent applications in USPTO (279 patents) and EPO (328 patents) databases was significantly greater than the amount found in the Brazilian bank (76 patents) (Figure 1). It is noteworthy that the number of plant extracts applied to cosmetics patents deposited in Brazil does not reflect the reality of this market. According to data from Euromonitor 2009, Brazil ranked third in the worldwide market for Personal Hygiene, Perfumery and Cosmetics, behind only the United States and Japan (Abihpec, 2010). Moreover,

the richness of Brazilian biodiversity would justify higher numbers in cosmetics innovation.



**FIGURE 1** - Number of patents on herbal extracts applied in cosmetic area deposited in EPO, USPTO and INPI databases.

There are several factors to consider in seeking an explanation for Brazil's performance in patenting. According to the World Intellectual Property Organization (WIPO), historically, patent filings tend to dip during periods of economic difficulty simply because fewer resources are available for investment in the innovation cycle. Once the economic cycle improves, patenting activity tends also to recover (OECD, 2009). For instance, the number of patent applications made by American applicants in 2010 was 20% lower than before the global financial crisis in 2008, illustrating how economy affects the innovation process (Moreira, 2011).

However, economic growth does not necessarily leads to an increase of patents. In 2010, Brazil's economy grew, but its international patent applications fell 14.4% (Moreira, 2011). This fact can be explained by the growth of the country being associated with multinationals in the commodities sector, not with high-tech industries that promote innovation. In 2010, sales of five commodities - iron ore, crude oil, soybeans, sugar and meat complex - accounted for 43.4% of total exports by Brazil (Lamucci, 2011). These data show the relationship between economies and innovation, not only with regard to the economic performance of a nation, but also to the profile of its economy.

In addition, regarding factors responsible for the low number of patents, according to Borten (2006), it can also be considered an inertial factor, because if there are not registered patents in significant numbers, knowledge of the subject is not propagated, there is not a demonstration effect and, therefore, a vicious circle is formed

It is important to highlight that patent is territorial, so it only has value in the countries where the protection

request was made. So, if this privilege is required, for example, only in the United States, any institution in the world can replicate the research and commercialize the resulting product, except in the U.S. territory. Thus, the numerical inferiority of patents in the INPI in comparison to the EPO and USPTO databases also expresses some business risk for these patent banks applicants. It is worth noting that there is a legal period of twelve months starting from the first deposit for the privileges of the patent to be extended to other countries.

### Evolution in the number of deposits in Brazil

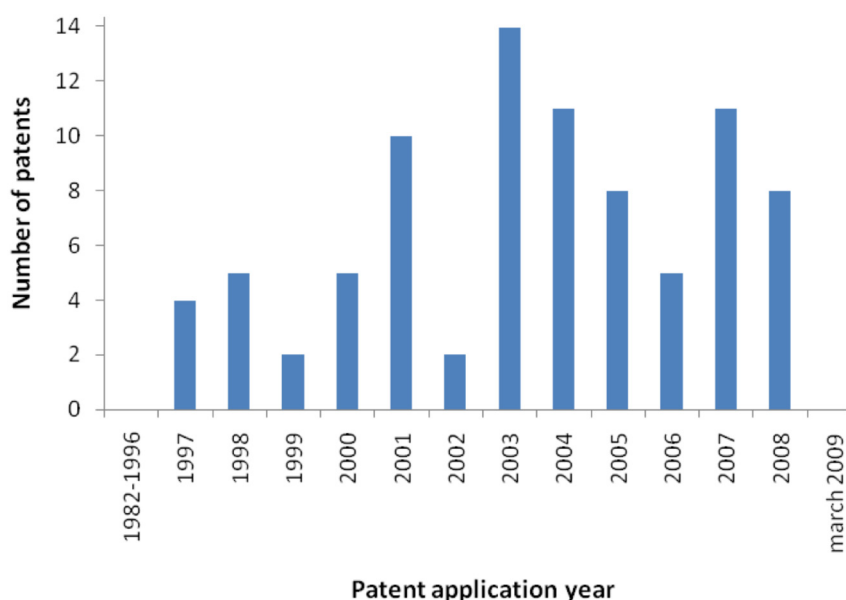
Also according to the survey, there is a discontinuous evolution over the years regarding the number of patents in Brazil. As shown in Figure 2, 2003 was the year that most patents involving plant extracts for cosmetic purposes were deposited, totaling 14 applications. However, in the following three years there has been a progressive fall in the number of deposits.

One possible explanation for this irregular behavior lies in the limited number of companies that often develop innovations and adopt patents as a form of industrial protection. Whereas few companies invest in research and development of new products, the number of patents in this sector is subject to many fluctuations due to factors such as economy, difficulties in the research, among others. Table I shows the five companies with the highest number of patents concerning the use of plant extracts in the cosmetic area in the period between 1982 and 2009.

Despite the discontinuous evolution regarding the number of patents in Brazil, since 2003, there was an evident increase in the number of applications, following the growing consumer demand for personal care products containing natural ingredients. For instance, according to Organic Monitor, a research and consulting company specialized in global organic and related product industries, the European market size for natural and organic cosmetics in 2006 was estimated to be US\$1.5 billion. In addition, natural and organic products were estimated to account for 3% of all personal care products sales in Europe in 2009. Notwithstanding this is a relatively small percentage, it showed an annual growth rate of 20% (Organic Monitor, 2007). Data on the Brazilian market for natural cosmetics are scarce, since it is a recent market.

### INPI applicants' profile

Despite the lack of companies with a considerable number of patents registered at INPI, the second sector (industry) is the main responsible for innovation in the cos-



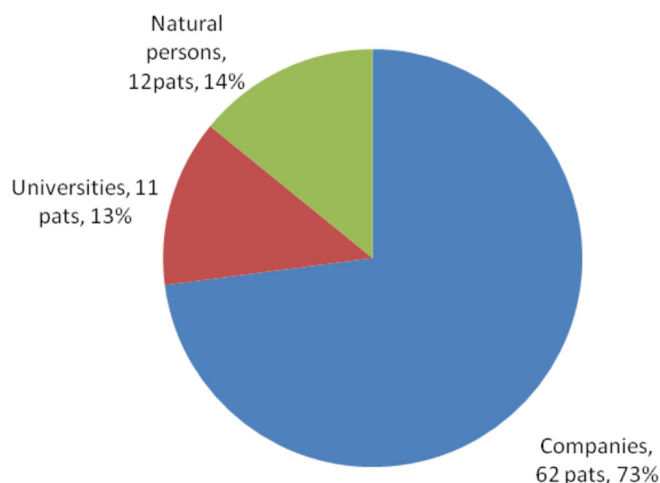
**FIGURE 2** - Evolution of herbal extracts patenting for cosmetic application in INPI in the period 1982-2009.

**TABLE I** - Major companies with patents registered in INPI

Company	Country	Number of registers
L'oreal	France	12
Chemyunion	Brazil	9
Avon	United States	4
Cognis	France	4
Unilever	Netherlands	4

metic area. Figure 3 shows the prevalence of the industrial sector (73%), followed by the participation of natural persons (14%) and universities (13%). The minor participation of research centers and educational institutions in the filing of patents can be justified by the productivity model deployed by CAPES/MEC, which evaluates the professors for their scientific output. Thus, Brazilian scientists usually publish their work in journals of high impact, rather than obtaining patents (Arruda, 2009).

In 2009, Brazil achieved the mark of 32,000 articles published in scientific journals indexed in the Institute for Scientific Information (ISI), representing 54% of total Latin American and 2.69% of world production (Cruz, 2010). In contrast, according to a survey by Matias-Pereira (2010), in the period from 2005 until 2007, Brazil had only 288 patents granted in USPTO against 359 for Malaysia, 1,410 for India, and 2,775 for China. In accordance with the author of the study, one explanation for the low performance of Brazil in the major rankings of applications for registration of patents in the world is related to the low proportion of researchers working in private companies.



**FIGURE 3** - Patent applicant types in INPI database.

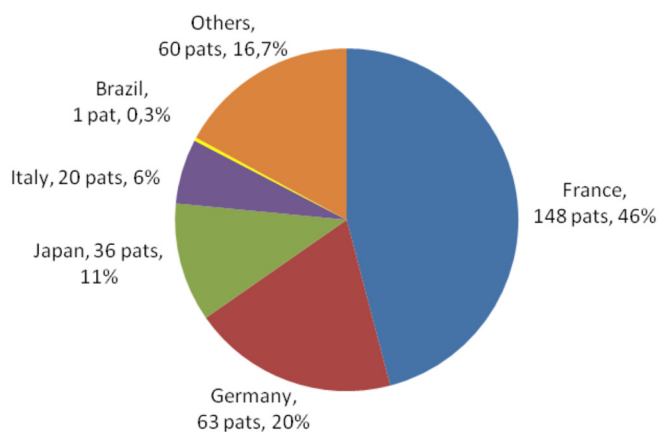
In developed countries, up to 80% of researchers and their studies are located in companies, while the rest are in the academy. In Brazil, this situation is reversed.

There is also the mistaken notion that patents prevent the dissemination of research. In fact, it is important just to postpone the publication of scientific articles until their patent application is filed (Moreira, Antunes, Pereira Jr, 2004). The unconformity between numbers of scientific articles and patents makes Brazil a generator of data and knowledge without protection for subjects with high potential for industrial application, and even worse is the loss of opportunity for marketing and of related benefits, supported by international agreement in the field of patent systems (Tomioka, Lourenço, Facó, 2010).

Aiming to reverse this situation, the State of São Paulo Research Foundation (FAPESP), have created programs to improve the utilization of biodiversity, and to translate research results into commercial products. Created in 1999, the Research Program in the Characterization, Conservation, Restoration and Sustainable Use of Biodiversity of State of São Paulo (BIOTA-FAPESP) aims to map and analyze the biodiversity of the State of São Paulo and also to assess the possibilities of sustainable exploitation of plants and animals with economic potential. In addition, FAPESP created, in 1997, the program Innovative Research in Small Businesses (PIPE), to support the implementation of scientific and or technology research in small companies. Cosmetic companies, as Chemyunion and Yago Lascano, have already resorted to this program for the development of new projects.

### EPO applicants' profile

By analyzing the distribution of applicant's countries in the European patent bank (Figure 4), it can be seen that France (46%) is the main holder of patents related to plant extracts applied to cosmetics, followed by Germany, Japan and Italy, with 19%, 11% and 6% of the patents, respectively. In this survey we found only one patent whose applicant was in Brazil (0.3%). These results reflect the strategy of innovation and product development adopted by companies in different countries. Companies that adopt an offensive strategy invest a significant part of its capital in research and development (R & D) to introduce innovations into their products (Baxter, 2000).



**FIGURE 4** - Distribution of patents in the world according to EPO database.

One of the main steps in the process of developing new products is bioprospecting. Bioprospection is defined as the screening and exploration of biological diversity and

traditional knowledge for commercially valuable genetic and biochemical resources. Companies that sponsor bioprospecting expeditions expect to find information from biological resources that will lead to new products, such as new drugs and cosmetic ingredients. However, a growing number of critics remonstrate against bioprospectors that often fail to appropriately compensate the countries and communities that provide access to their resources and associated traditional knowledge. Such critics argue that patents on products developed as a result of the efforts of 'bioprospectors' are based so closely on traditional knowledge that they are in fact a form of intellectual piracy (Dutfield, 2003).

Biopiracy may be defined as "the phenomenon where biological resources and traditional knowledge associated with indigenous peoples (including indigenous communities, local, rural, depending on its definition in each country) are used in an irregular, illegal, unfair, and inequitable way" (Bardi, Gutiérrez-Oppe, Politano, 2010). Data on economic losses caused by biopiracy are scarce and rarely found in literature. Nevertheless, according to a report commissioned by the United Nations Development Programme (UNDP), if unpaid royalty payments were being made to developing countries and indigenous peoples for the plant varieties and local knowledge used by multinational companies, those providers would be earning an estimated 5.4 billion USD a year (UNDP, 1994). Although there are no current reliable data, it is believed that losses related to biopiracy are now even more intense.

The solution with the greatest potential to reverse this situation must be investments in research to explore the most of the national biodiversity, anticipating the actions of biopirate companies. Investing in formation of qualified researchers, attractive working conditions for these professionals, as well as stiffer penalties for institutions that illegally take possession of biological resources and traditional knowledge are other key measures to reduce biopiracy.

Despite the current scarcity of Brazilian patents filed in the EPO database, this situation may change in the long-term. National companies such as Natura and Chemyunion are examples of national institutions that invest adequately in R & D. The first invests an average of 8% of revenues in new products development per year (Fusco, 2010), while the latter invested, in 2008 alone, about R\$ 103 million (Finep, 2010).

### Applications distribution

The types of applications of plant extracts in the cosmetic area, referring to the patents filed in INPI, are

illustrated in Table II. A tendency for multifunctional product innovation (12 patents, 14%) can be observed, which form a diverse range of properties. As an example, one of the patents refers to the use of a plant extract for the treatment of gynoid lipodystrophy (cellulitis) and acne (Avon products, Inc., 2005). Multifunctional cosmetic ingredients are considered a market trend and have the advantage of allowing formulators to prepare products more efficiently and economically. An example of multifunctional cosmetic ingredient is phenoxyethanol, mainly used for its preservative property, and also responsible for a slight rose odor in perfumes (Produtos, 2005).

**TABLE II** - Cosmetic applications of plant extracts in INPI database

Application	Number of registers
Multifunctional	12
Extraction process	9
Anti-aging	8
Skin/hair pigmentation	7
Anti-cellulitis	6
Skin/hair conditioning	6
Photoprotection	5
Antimicrobial	4
Antioxidant	3
Skin whitening	2
Deodorant	2
Anti-inflammatory	2
Not specified	8
Others	11

There are also a large number of patents on extraction processes used in active ingredients isolation (9 patents, 11%) with possible application in cosmetics. In USPTO and EPO databases, the percentage of patents related to extraction procedures are 2.5 and 1.8% respectively. This type of patent generally describes the process of extraction of plant components, about which there are previous reports indicating their activities. These are patents that describe more efficient or alternative methods for obtaining substances of commercial interest, without checking their activity. Rounding out the group of major applications are the use of extracts with anti-aging and pigmentation of skin and hair, with 8 and 7 registries, respectively.

## CONCLUSION

From this study, it was concluded that, in Brazil, the number of patents involving plant extracts for cosmetic development is much lower than that found in the U.S. and European patents banks. The small number of companies investing in R & D in Brazil, the little incentive granted by institutions to encourage research on the conversion of results into patents, and other cultural and economic issues, are considered the main factors contributing to this scenario. One of the main consequences of the scarcity of patents is the loss of opportunities for commercial exploitation of biodiversity, a target of companies from developed countries and protected by the patent system.

Although the number of patents registered in Brazil does not match the magnitude of the third-largest cosmetics market, a variety of cosmetic applications that follow the trends of the international market is found, represented by a large number of multifunctional products. Moreover, recent efforts of some national companies in developing new products, and also the incentive to exploitation of Brazil's biodiversity made by institutions like FAPESP, have the potential to alter in the long-term the current innovation scenario in the country.

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