World Patent Information 47 (2016) 21–33

Contents lists available at ScienceDirect

World Patent Information

journal homepage: www.elsevier.com/locate/worpatin

Research and development on Moringa Oleifera – Comparison between academic research and patents

Henri Dou [a, *], Jacky Kister [b]

[a] Competitive Intelligence Think Tank, 93 rue du Rouet, 13008, Marseille, France
[b] Laboratoire METICA, Site de l'Etoile, Aix Marseille Université, AMU, 13397 Marseille Cedex 20, France

ARTICLE INFO

Article history:
Received 1 December 2014
Received in revised form
11 July 2016
Accepted 4 September 2016
Available online 15 September 2016

Keywords:
Moringa
Matheo patent
Matheo analyzer
Automatic patent analysis
Bibliometrics
Research management

ABSTRACT

Moringa is a tropical plant well known in Asia and Africa. Many local medicines used the various Moringa extracts to cure various diseases or to provide nutrients. Some parts of the plant are also use as co-agulants to clean water and for their biomedical properties. The regional development of developing countries is often linked to their natural resources and applied research and technology information are two main points to explore before decision making. For these reasons we present a comparison between data coming from an academic research using different sources and patent information using the worldpatent database from EPO.

1. Introduction

Moringa Oleifera, is often considered as one of the best plants to struggle against malnutrition. But, if most parts of the tree are edible, some of them may also be used as a source of pharmaceutical chemicals, as cosmetic additives as well as agent to purify water. "The Multipurpose trees [1] are deliberately grown and managed for more than one output. They may supply food in the form of fruit, nuts, or leaves that can be used as vegetable; while at the same time supplying firewood, add nitrogen to the soil, or supply some other combination of multiple outputs. "Multipurpose tree" is a term common to agroforestry, particularly when speaking of tropical agroforestry where the tree owner is a subsistence farmer."

Today various non-profit associations develop projects in Africa and Asia to provide out of various parts of the Moringa, oil, nutrient powder, antibacterial products, coagulants for water purification. Some of these projects have been submitted to the World Bank, other such as Moringa plantations are developed in Morocco for instance to struggle against the desertification. On a scientific point of view, scientific papers dealing with various aspects of the Moringa's properties have been published and this indicates that an important concern exist about the use of this plant. Moreover the development of the "green chemistry and green chemical" prompt for the search for new bio sourced chemical [2].

All these reasons prompt us to realize a study of the R&D on Moringa using the patent information on one hand and on the other hand Medline data for the scientific research upstream.

2. Material and methods

In bibliometrics, we proceed in a way which is different from the classical documentation where the goal is to obtain a very precise answer, fitting exactly with the subject and with the minimum of noise. What we are looking from is the knowledge of the scientific and technical environment of a subject. This means that we proceed with a large and general query first, retrieve the data, and after proceed to the statistical analysis. This method very handy, allows rapidly to bubble up the main orientations developed in research or development. This is the reason why we applied it, to science (WoS and Google Scholar) and to the patents through the EPO European Patent Office database (Espacenet).

2.1. Web of Science

The search is done between 2010 and 2015 using the word

* Corresponding author.
E-mail addresses: douhenri@yahoo.fr (H. Dou), jackykister@voila.fr (J. Kister).

http://dx.doi.org/10.1016/j.wpi.2016.09.001
0172-2190/

"Moringa" in the title of the articles. 552 references are selected. We use first the analysis capacity of the Web of Science to have an overview of the subject, and we download 500 references out of the 552 (500 is the up most value accepted by Medline) for an analysis with Matheo Analyzer software [3].

2.2. Medline

The provider of the database is PubMed |4], which offers the possibility to query the Medline database and to upload the result in a text format suitable for a bibliometric analysis.

The query was "Moringa" in titles (to provide the best relevant bibliographic notices), the date of the query was July December 17th, 2015. The answer was 267 references which were downloaded according the facility offers by PubMed and the date interval from 2010 to 2015.

2.3. PoP publish or perish

PoP software is one of the best way to download references from Google Scholar and to sort them by dates, or relevance (citation numbers from Google Scholar). This also provides a view different from the WoS since the coverage of Google Scholar is different. The term "Moringa" is used to search Google Scholar via PoP [5].

2.4. Patent

The provider of the worldpatent database is the EPO (European Patent Office). The query of the database is done with the word "Moringa" in the titles or in the abstracts. 356 patents are selected gathered in 171 families. The query was made in December 17th, 2015. The date interval was from 2010 to 2015.

As far as the patents are concerned we have various tools enable to retrieve the patents with the Moringa in titles and abstracts, or for the PCT and European patents from the titles, titles and abstracts, claims or descriptions [6]. We used the priority date to determine the date interval, since according S. Hinze and U. Schmoch [7] "Nevertheless we prefer the priority date as the reference owing to its close link with the finalization of the invention and thus the R&D". It is obvious that using the claims and the descriptions will bring a lot more patents than to use titles and abstracts. But, a close examination of the patents which do not contain the word Moringa in titles and abstracts, but only in claims or descriptions or both underlines the fact that these patents are not concerned with major applications of Moringa uses or transformations. Most of the time Moringa leaves, seed, oil, are used as food additives, situation which is well known and do not provide very inventive applications. The same situation occurs when a patent deals with all types of vegetable or edible oil for instance. If the user wants also to explore the patents with only Moringa in claims or descriptions but not in the title or abstracts this can be done easily with PCT and EP patents. For US patents this can be done using Google Scholar for instance where the search is done on the full text of the patent (but in this case the difference between title-abstract and claims – description cannot be done automatically or by using the full text access to the US Patent database [8]. This is why we remain only to the use of Moringa in titles and abstracts. The two following patents give an example:

Patent retrieve from the description field only

Titre Français: Procédé De Production D'émulsions Eau Dans Huile Aérées Et ÉMulsions Aérées
Deutsch Titel: Verfahren Zur Herstellung Von Belüfteten Wasser-in-öl-emulsionen Und Belüfteten Emulsionen
Patent Number: EP2833729B1

Abstract

The present invention relates to a method for the production of aerated water-in-oil emulsions containing sucrose fatty acid esters. The invention further relates to aerated water-in-oil emulsions containing sucrose fatty acid esters, and to use of the composition for shallow flying and baking of food products. The method comprises a step wherein an oil is mixed with sucrose fatty acid ester, followed by aeration of this mixture. The obtained foamed oil is mixed with a water-in-oil emulsion. (From US2015327565 A1).

Extract of the description

(040) Fats include: plant oils (for example: allanblackia oil, apricot kernel oil, arachis oil, arnica oil, argan oil, avocado oil, babassu oil, baobab oil, black seed oil, blackberry seed oil, blackcurrant seed oil, blueberry seed oil, borage oil, calendula oil, camelina oil, … …. macadamia oil, maize oil, mango butter, meadowfoam oil, melon seed oil, moringa oil, mowrah butter, mustard seed oil, olive oil, orange seed oil, palm oil, palm kernel oil, papaya seed oil, passion seed oil, peach kernel oil, plum oil, … …. animal oils (for example: butter or conjugated linoleic acid, lard or tallow); or any mixture or fraction thereof.

The claims do not contain the term Moringa. The abstract as well as the tittle do not contain the term Moringa.

Patent retrieve from the claim field only

Bibliographic description

Titre Français: Intervention Diététique Avec Apport Calorique Quotidien Réduit
Patent Number:WO2015184401A1

Abstract

The invention relates to various compositions for controlling body weight and/or for promoting weight loss. Examples of these compositions include but are not limited to Formula I, Formula I-vegan, Formula II, and Formula III. The invention also relates to methods of using these compositions and kits including these compositions to control body weight and/or promote weight loss.

The abstract as well as the tittle do not contain the term Moringa.

Claims

1. A composition (Formula I), comprising one or more of: Whey Protein; Cocoa Powder; Pea Protein; Fructose; Natural Flavors;

Table 1
Number of authors per articles.

Web of science		Medline		Google scholar (PoP)	
Nb authors	Nb papers	Nb authors	Nb papers	Nb authors	Nb papers
1	23	1	13	1	128
2	57	2	47	2	161
3	96	3	64	3	247
4	87	4	60	4	283
5	96	5	52	5	164
6	75	6	28	6	17
7	31	7	21		
8	14	8	10		
9	14	9	11		
10	4	10	6		
11	5	11	0		
12	3	12	1		
13	2				
15	1				
16	1				
18	1				

Vitamin and Mineral Premix … ….Chlorella Powder; Spirulina; Acerola Berry Powder; Camu Camu Extract; Pomegranate Juice Powder; Sacha Inchi Powder; Astragalus Root Powder; Bilberry Fruit Powder; Blueberry Fruit Powder; Lycium/Goji; … ……. Rose Hips Powder; Schisandra Berry Powder; Cinnamon Powder; Ginko Biloba Leaf Powder; Moringa Leaf Powder; and Mixed Tocopherols.

2. The composition of claim 1, comprising one or more of: about 22–27%, 20–29%, 17–32%, or about 25% Whey Protein; about 17–21%, 15–23%, 12–26%, or about 19% Cocoa Powder; about 13–16%, … … Ginko Biloba Leaf Powder; about 0.046–0.056%, 0.044–0.058%, 0.041–0.061%, or about 0.051% Moringa Leaf Powder; and about 0.075–0.092%, 0.073–0.094%, 0.070–0.097 …….Maca Root Powder; Flaxseed; Xanthan Gum; Acerola Powder; Spirulina; Chorella; Camu-Camu Powder; Pomegranate Powder; Astragalus Root Powder; Bilberry Fruit Powder; Blueberry Fruit Powder; Lycium/Goji Berry Powder; Salt, Himalayan Pink; Moringa Leaf Powder; Pea Fiber; Quinoa Powder; Acai Powder; Methylsulfonylmethane; Spinach Powder; Natural Sweeteners; Ashwagandha Root Powder; Cordyceps Powder; Enzyme Blend; Maitake Powder; … ….and Ginko Biloba Leaf Powder Berry Powder; about 0.42–0.51%, 0.40–0.53%, 0.37–0.56%, or about 0.47% Salt, Himalayan Pink; about 0.42–0.51%, 0.40–0.53%, 0.37–0.56%, or about 0.47% Moringa Leaf Powder; about 0.35–0.42%, 0.33–0.44%, 0.30–0.47%, or about 0.38% Pea Fiber; about 0.33–0.41%, 0.31–0.43%, 0.28–0.46%, or about 0.37% … …

These two patents are not relevant, since they do not deal with transformation or direct use or special applications of Moringa.

In fact, most of the patents, if Moringa is present only in the claims or descriptions deal only with the development of various

Table 3
Different fields of application.

Web of science Categories	Records	% of 552
Pharmacology pharmacy	71	12.862
Food science technology	67	12.138
Plant sciences	50	9.058
Chemistry medicinal	43	7.790
Engineering chemical	42	7.609
Biochemistry molecular biology	35	6.341
Agronomy	35	6.341
Environmental sciences	34	6.159
Biotechnology applied microbiology	34	6.159
Water resources	31	5.616
Agricultural engineering	29	5.254
Agriculture multidisciplinary	27	4.891
Biology	26	4.710
Agriculture dairy animal science	26	4.710
Chemistry multidisciplinary	23	4.167
Integrative complementary medicine	19	3.442
Nutrition dietetics	18	3.261
Energy fuels	18	3.261
Toxicology	17	3.080
Chemistry applied	17	3.080
Veterinary sciences	16	2.899
Engineering environmental	16	2.899
Chemistry analytical	13	2.355
Cell biology	12	2.174
Multidisciplinary sciences	11	1.993

Table 2
Web of Science categories.

Organizations	Records	% of 552
Univ Agr Faisalabad	21	3.804
Univ Putra Malaysia	19	3.442
Univ FED Pernambuco	17	3.080
Univ Estadual Maringa	14	2.536
Mahidol Univ	14	2.536
Univ Ft Hare	12	2.174
Univ Fed Uberlandia	11	1.993
Univ Fed Ceara	10	1.812
Hawassa univ	9	1.630
Univ Addis Ababa	8	1.449
Univ Malaya	7	1.268
Univ Ibadan	7	1.268
Univ Estadual Campinas	7	1.268
CSIR	7	1.268
Chulalongkorn Univ	7	1.268
Bahauddin Zakariya Univ	7	1.268
Univ Witwatersrand	6	1.087
Univ Vet Anim Sci	6	1.087
Univ Pretoria	6	1.087
Rutgers State Univ	6	1.087
King Saud Univ	6	1.087
Khon Kaen univ	6	1.087
Cairo Univ	6	1.087
Uppsala Univ	5	0.906
Univ Limpopo	5	0.906

Table 4
Different countries present.

Countries	Records	% of 552
India	112	20.290
Brazil	81	14.674
USA	48	8.696
South Africa	40	7.246
Pakistan	36	6.522
Nigeria	33	5.978
Malaysia	33	5.978
Thailand	30	5.435
Egypt	25	4.529
Germany	19	3.442
Saudi Arabia	16	2.899
Ethiopia	16	2.899
Mexico	15	2.717
Sweden	12	2.174
Spain	12	2.174
Portugal	9	1.630
South Korea	8	1.449
Philippines	8	1.449
Peoples R China	8	1.449
Iran	8	1.449
France	7	1.268
Australia	7	1.268
Taiwan	6	1.087
Sudan	6	1.087
Japan	6	1.087

Table 5
Main organizations.

Organizations	Records	% of 552
Ahmadu Bello Univ	2	0.362
Al Baha Univ	2	0.362
All India inst med sci	3	0.543
Anna Univ	2	0.362
Appalachian State Univ	2	0.362
Avinashilingam Univ	3	0.543
Bahauddin Zakariya Univ	7	1.268
Bahauddin Zakariya Univ Multan	2	0.362
Banaras Hindu Univ	3	0.543
Beni Suef Univ	2	0.362
Bhabha Atom Res CTR	4	0.725
Bharathiar Univ	2	0.362
Bharathidasan Univ	2	0.362
Bharati Vidyapeeth Coll Pharm	3	0.543
Cairo Univ	6	1.087
Canakkale Onsekiz Mart Univ	3	0.543
CENT Food Technol RES Inst	5	0.906
CENT Inst Med Aromat plants	2	0.362
CENT Inst Res Buffaloes	2	0.362
Chulalongkorn Univ	7	1.268
Cochin Univ Sci Technol	2	0.362
Commiss Biotechnol Genet Engn	2	0.362
Covenant Univ	3	0.543
CSIR	7	1.268
CSIR CENT Food Technol Res Inst	3	0.543

Table 6
Main authors.

Authors	Frq.
Paiva, PMG	17
Coelho, LCBB	17
Basra, SMA	14
Napoleao, TH	12
Bergamasco, R	11
Muchenje, V	11
Vieira, AMS	8
Nouman, W	8
Masika, PJ	8
Fakurazi, S	7
Vongsak, B	7
Gritsanapan, W	7
Saini, RK	7
Shetty, NP	7
Giridhar, P	7
Arulselvan, P	6
du Toit, ES	6
Coelho, NMM	6

products mainly food, where small amounts of Moringa leaves or oil or seeds or seed powder are added among many other ingredients. This is well known and most of the time does not concern the core inventive aspect of the patents.

2.5. Import

The downloaded files from the WoS and Medline are imported into Matheo Analyzer [4] for further analysis. Matheo Analyzer is a software which performs bibliometric analysis on all the information fields of the Medline references including the mesh terms. The data in each fields may be selected, formatted, combined etc. to give rise to lists, matrix, networks.

For Pop the downloading is done directly by the software itself.

The downloaded file from the worldpatent database is automatically integrated in Matheo Patent [4] [5]. All the patent information include in a patent notice, which can be combined to give rise to lists, matrix, networks, specific groups of data can be selected and analyzed and combined if necessary.

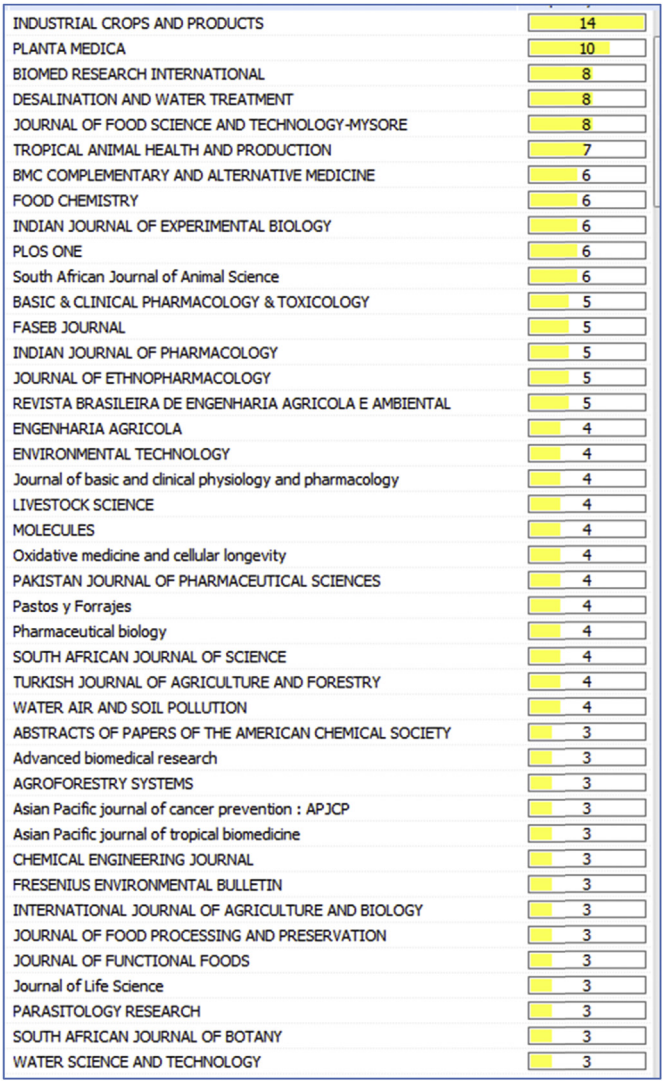

Fig. 1. Main journals.

2.6. General remark

All the studies done with different information sources show that the number of papers or patents published each year is increasing. This indicates an important concern for the Moringa applications and products.

Another remark is that the number of authors per article varied widely from one data base to the other (the Patents are not concerned here). The data are indicated in the following figure (see Table 1).

3. Analysis of the WoS data

The analysis is done in two ways, one using the analytic feature provided by the WoS. The other by downloading the data from the WoS (no more than 500 references) and analyzing them with Matheo Analyzer, a bibliometric software.

	Bergamasco R	Viera AMS	Paiva PMG	Coelho LCBB	Muchenge V	Basra SMA	Masika PJ	Nishi L	Madrona GS	Napoleao TS	Nkukawana TT	Meneghel AP	Goncalves AC	Rubio F	Vongsak B	Gritsanapan W	Paterniani JES	Hoffman LC	Dzama K	Coelho NMM
Seed	3	1	7	7	1	5	1	1	3	5		3	3	3			3			3
Leaf	1	1			8	6	5				5				6	6		4	4	
Water	9	6	2	2		1		3	3	2		3	3	3			2			
Oil					4		3				4							4	4	
Anti-oxydant			1	1	2	2	2								2	2				
Coagulation coagulant	7	6	4	4				4	2	1							3			
Absorp. Remov. metal	4	3	1	1		1		2	1			3	3	3						5
Inflammatory			1	1						1										
Anti cancer																				

Fig. 2. Benchmarking of the various authors (in part).

Table 7
Main authors.

Authors	Frq.
Coelho, Luana Cassandra Breitenbach Barroso	7
Paiva, Patricia Maria Guedes	7
Arulselvan, Palanisamy	6
Fakurazi, Sharida	6
Paiva, Patricia M G	6
Coelho, Luana C B B	6
Napoleao, Thiago Henrique	6
Asghari, Gholamreza	5
Vongsak, Boonyadist	4
Gritsanapan, Wandee	4
Oliveira, Jose T A	4
Pereira, Mirella L	4
Grangeiro, Thalles B	4
Vasconcelos, Ilka M	4
Kwaambwa, Habauka M	4
Navarro, Daniela Maria do Amaral Ferraz	4
Karthivashan, Govindarajan	3
Asghari, G	3
Santos, Andrea F S	3
Napoleao, Thiago H	3
Batista, Adelina B	3
Rennie, Adrian R	3
Wattanathorn, Jintanaporn	3
Muchimapura, Supaporn	3
Mewis, Inga	3
Waterman, Carrie	3
Rojas-Silva, Patricio	3
Raskin, Ilya	3
Sharma, Veena	3
Paliwal, Ritu	3
Santos, Nataly Diniz de Lima	3
Pontual, Emmanuel Viana	3
Muchenje, V	3
Masika, P J	3
Dey, Sanjit	3
Alves, Vanessa N	3
Tuntipopipat, Siriporn	3
Sreelatha, S	3
Padma, P R	3

Table 8
List of the main journals.

Journals	Frq.
J Food Sci Technol	8
Indian J Exp Biol	7
Trop Anim Health Prod	7
Environ Technol	6
Asian Pac J Cancer Prev	6
PLoS One	6
Food Chem	6
J Ethnopharmacol	6
BMC Complement Altern Med	5
Water Sci Technol	5
Asian Pac J Trop Biomed	5
J Basic Clin Physiol Pharmacol	4
Biomed Res Int	4
Pak J Pharm Sci	4
Molecules	4
Asian Pac J Trop Med	3
Res Pharm Sci	3
Int J Mol Sci	3
Food Chem Toxicol	3
Adv Biomed Res	3
Pharm Biol	3
Langmuir	3
Parasitol Res	3
J Food Sci	3
Zhong Xi Yi Jie He Xue Bao	3

3.1. Analysis according the WoS facilities

All the data are provided in the following tables (See Tables 2–5).

Table 2 Main Institutions present.

3.2. Bibliometric analysis

The analysis has been done to complete the above data (see Table 6, Fig. 1).

From the downloaded data, Matheo Analyzer constructs a local database. This database can be searched offline to determine various “strategic groups of interest” according the needs of the user(s). The following figure shows a “benchmarking” of the authors according these various groups (see Fig. 2).

4. Analysis of the medline data

4.1. The search

All the different results and analysis are presented in the following figures and Figures (see Tables 7–9).

As we did with the WoS, we selected from the local database

Table 9
Main countries.

Countries	Frq.
India	55
Brazil	33
Nigeria	20
Thailand	17
United States	14
Malaysia	13
South Africa	11
Iran	10
Egypt	10
Germany	7
Pakistan	7
Ethiopia	6
Canada	6
Sweden	4
Italy	3
Portugal	3
China	3
Botswana	3
Netherlands	3
Singapore	3

(from the downloaded Medline data), "strategic groups" according the needs of the user(s). These groups can be correlated with countries, years, etc. Medical subject headings may also be used to build such a groups [9] (see Figs. 3 and 4).

5. Analysis of Google Scholar data with PoP

The following figure indicates the table obtained from PoP. The other figures will show the same results sorted differently. The figures indicated do not show all the results, since Google permits only to download 1000 references (Figs 5 and 6).

The data can also be sorter by alphabetical order (first author), or by journals of publication (see Fig. 7).

Let us note the important number of African Journals: Afr J Biotechnol, Afr J Microbiol research, Afr Journal of Pharmacy Pharmacology, Afr J of Plant Sciences, Afr J of Food Sciences, Afr J of Plan, Afr J of Traditional Medline.

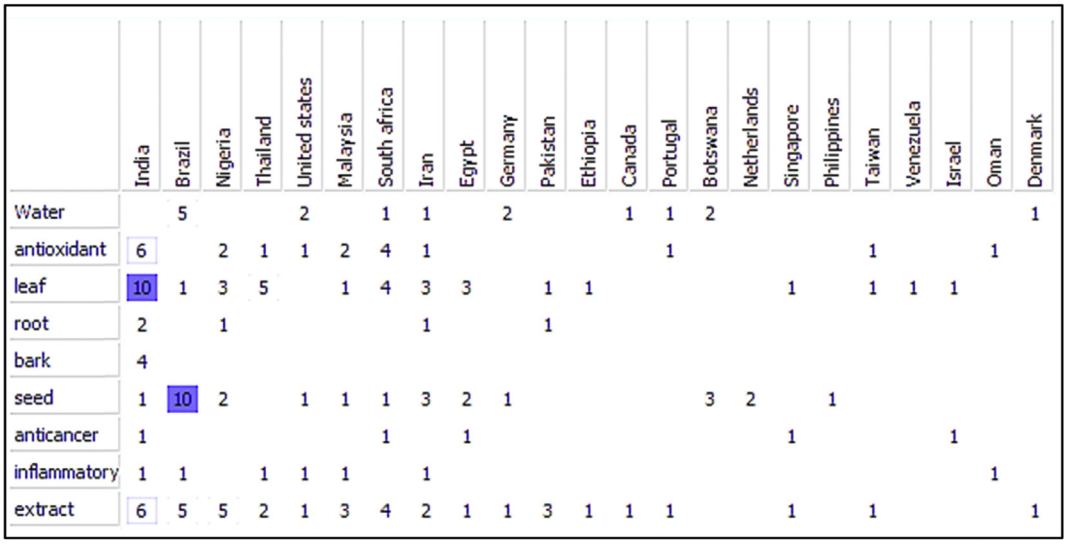

Fig. 3. Main strategic groups and countries.

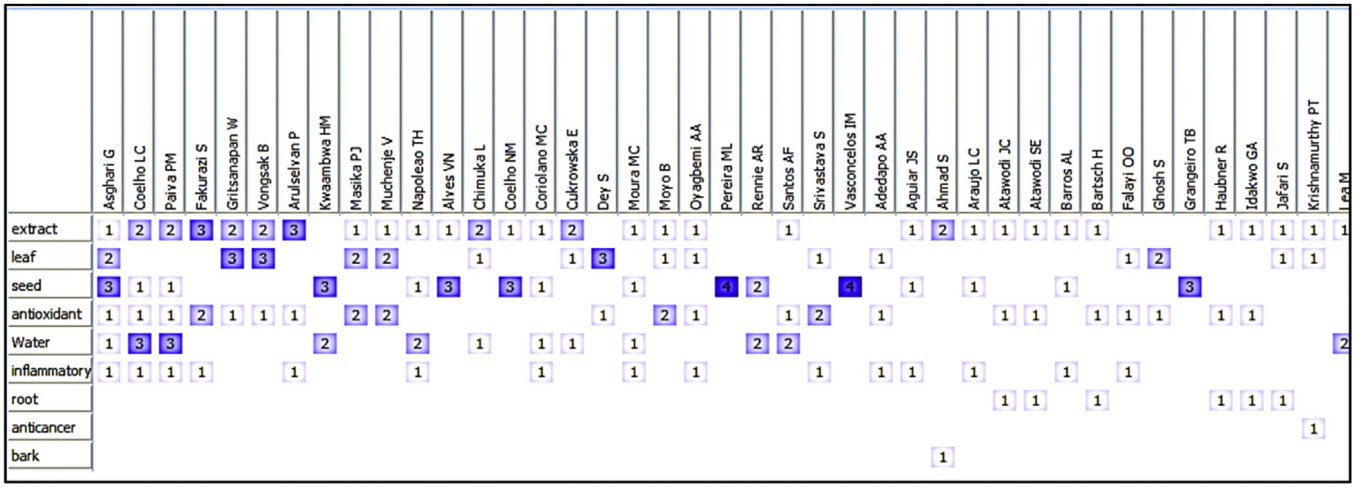

Fig. 4. Main Strategic groups and authors.

Per year	Rank	Authors	Title	Year	Publication
23.80	3	DHK Reddy, K Seshaiah, AVR Reddy, MM Rao...	Biosorption of Pb 2+ from aqueous solutions by Moringa oleifera bark: equilibrium and kinetic studies	2010	Journal of Hazardous ...
22.50	4	T Prasad, EK Elumalai	Biofabrication of Ag nanoparticles using Moringa oleifera leaf extract and their antimicrobial activity	2011	Asian Pacific journal of tropical biomedicine
21.75	2	K Prabhu, K Murugan, A Nareshkumar...	Larvicidal and repellent potential of Moringa oleifera against malarial vector, Anopheles stephensi Liston (Insecta: ...	2011	Asian Pacific journal of ...
17.00	6	C Martín, A Moure, G Martín, E Carrillo...	Fractional characterisation of jatropha, neem, moringa, trisperma, castor and candlenut seeds as potential feedst...	2010	Biomass and ...
16.60	5	SE Atawodi, JC Atawodi, GA Idakwo...	Evaluation of the polyphenol content and antioxidant properties of methanol extracts of the leaves, stem, and roo...	2010	... of medicinal food
19.75	8	DHK Reddy, DKV Ramana, K Seshaiah, AVR ...	Biosorption of Ni (II) from aqueous phase by Moringa oleifera bark, a low cost biosorbent	2011	Desalination
15.20	1	TS Anjorin, P Ikokoh, S Okolo	Mineral composition of Moringa oleifera leaves, pods and seeds from two regions in Abuja, Nigeria.	2010	International Journal of Agriculture ...
24.33	13	DHK Reddy, K Seshaiah, AVR Reddy, SM Lee	Optimization of Cd (II), Cu (II) and Ni (II) biosorption by chemically modified Moringa oleifera leaves powder	2012	Carbohydrate Polymers
36.50	14	B Moyo, PJ Masika, A Hugo, V Muchenje	Nutritional characterization of Moringa (Moringa oleifera Lam.) leaves	2013	African Journal of Biotechnology
14.40	7	TS Olugbemi, SK Mutayoba, FP Lekule	Effect of Moringa (Moringa oleifera) inclusion in cassava based diets fed to broiler chickens	2010	International Journal of ...
18.00	9	S Sreelatha, A Jeyachitra, PR Padma	Antiproliferation and induction of apoptosis by Moringa oleifera leaf extract on human cancer cells	2011	Food and Chemical Toxicology
14.40	12	JN Kasolo, GS Bimenya, L Ojok...	Phytochemicals and uses of Moringa oleifera leaves in Ugandan rural communities	2010	... of Medicinal Plants ...
23.33	22	M Mbikay	Therapeutic potential of Moringa oleifera leaves in chronic hyperglycemia and dyslipidemia: a review	2012	Frontiers in pharmacology
13.80	16	DHK Reddy, Y Harinath, K Seshaiah...	Biosorption of Pb (II) from aqueous solutions using chemically modified Moringa oleifera tree leaves	2010	Chemical Engineering ...
12.20	11	AA Hamza	Ameliorative effects of Moringa oleifera Lam seed extract on liver fibrosis in rats	2010	Food and Chemical Toxicology
12.00	17	M Pritchard, T Craven, T Mkandawire...	A comparison between Moringa oleifera and chemical coagulants in the purification of drinking water–An alternativ...	2010	... of the Earth, Parts A/B/C
12.00	19	A Bukar, A Uba, T Oyeyi	Antimicrobial profile of Moringa oleifera Lam. extracts against some food–borne microorganisms	2010	Bayero Journal of Pure and Applied Sciences
11.60	21	NK Amaglo, RN Bennett, RBL Curto, EAS Ros...	Profiling selected phytochemicals and nutrients in different tissues of the multipurpose tree Moringa oleifera L., gro...	2010	Food Chemistry
11.00	15	G Kafuku, M Mbarawa	Alkaline catalyzed biodiesel production from moringa oleifera oil with optimized production parameters	2010	Applied Energy
10.20	23	S Cheenpracha, EJ Park, WY Yoshida, C Barit...	Potential anti-inflammatory phenolic glycosides from the medicinal plant Moringa oleifera fruits	2010	Bioorganic & medicinal ...
16.67	18	M Mangale Sapana, G Chonde Sonal, PD Raut	Use of Moringa oleifera (drumstick) seed as natural absorbent and an antimicrobial agent for ground water treatment	2012	Research Journal of Recent ...
12.50	34	S Luqman, S Srivastava, R Kumar...	Experimental assessment of Moringa oleifera leaf and fruit for its antistress, antioxidant, and scavenging potential...	2011	Evidence-Based ...
12.25	30	U Rashid, F Anwar, M Ashraf, M Saleem...	Application of response surface methodology for optimizing transesterification of Moringa oleifera oil: Biodiesel pro...	2011	Energy conversion and ...
9.80	259	GHF Viera, JA Mourão, ÂM Ângelo...	Antibacterial effect (in vitro) of Moringa oleifera and Annona muricata against Gram positive and Gram negative ba...	2010	Revista do Instituto de ...
9.60	20	MM Khalafalla, E Abdellatef, HM Dafalla...	Active principle from Moringa oleifera Lam leaves effective against two leukemias and a hepatocarcinoma	2010	African Journal of ...
9.60	25	VN Alves, R Mosquetta, NMM Coelho, JN Bia...	Determination of cadmium in alcohol fuel using Moringa oleifera seeds as a biosorbent in an on-line system coupled ...	2010	Talanta
9.20	24	GS Madrona, GB Serpelloni, AMS Vieira, L Nis...	Study of the effect of saline solution on the extraction of the Moringa oleifera seed's active component for water t...	2010	Water, Air, & Soil ...
11.25	26	AO Ogbe, JP Affiku	Proximate study, mineral and anti-nutrient composition of Moringa oleifera leaves harvested from Lafia, Nigeria: p...	2011	The Journal of Microbiology, ...
11.25	37	CFR De Oliveira, LA Luz, PMG Paiva, LCBB Co...	Evaluation of seed coagulant Moringa oleifera lectin (cMoL) as a bioinsecticidal tool with potential for the control of ...	2011	Process ...
15.00	49	B Moyo, S Oyedemi, PJ Masika, V Muchenje	... content and antioxidant properties of Moringa oleifera leaf extracts and enzymatic activity of liver from goats s...	2012	Meat science
8.80	38	E Nibret, M Wink	Trypanocidal and antileukaemic effects of the essential oils of Hagenia abyssinica, Leonotis ocymifolia, Moringa ste...	2010	Phytomedicine
8.60	32	P Sudha, SMB Asdaq, SS Dhamingi, GK Chan...	Immunomodulatory activity of methanolic leaf extract of Moringa oleifera in animals.	2010	
8.60	39	MH Kalavathy, LR Miranda	Moringa oleifera—A solid phase extractant for the removal of copper, nickel and zinc from aqueous solutions	2010	Chemical Engineering Journal
14.00	43	R Gupta, M Mathur, VK Bajaj, P Katariya...	Evaluation of antidiabetic and antioxidant activity of Moringa oleifera in experimental diabetes	2012	Journal of ...
8.20	31	AMS Vieira, MF Vieira, GF Silva, ÁA Araújo...	Use of Moringa oleifera seed as a natural adsorbent for wastewater treatment	2010	Water, Air, and Soil ...
8.20	33	M Lea	Bioremediation of turbid surface water using seed extract from Moringa oleifera Lam.(drumstick) tree	2010	Current protocols in microbiology
13.67	45	S Fakurazi, SA Sharifudin, P Arulselvan	Moringa oleifera hydroethanolic extracts effectively alleviate acetaminophen-induced hepatotoxicity in experiment...	2012	Molecules

Fig. 5. Results obtained from PoP. Search Moringa database Google Scholar.

Per year	Rank	Authors	Title	Year	Publication
5.00	447	B Agrawal	Phyto pharmacological investigation of moringa oleifera and achyranthes aspera for their anti asthmatic activity	2015	
4.00	792	JEC Freire, IM Vasconcelos, FBMB Moreno, A...	Mo-CBP 3, an Antifungal Chitin-Binding Protein from Moringa oleifera Seeds, Is a Member of the 2S Albumin Family	2015	
3.00	883	N Sultana, AR Alimon, KS Huque, AQ Sazili...	The feeding value of moringa (Moringa oleifera) foliage as replacement to conventional concentrate diet in Bengal ...	2015	Advances in Animal ...
4.00	528	WJ Martin	Do the benefits of Moringa oleifera trees extend to KELEA activation of water	2015	Advances in Plants & Agriculture Research
2.00	739	A Toma, E Makonnen, Y Mekonnen...	Antidiabetic activities of aqueous ethanol and n-butanol fraction of Moringa stenopetala leaves in streptozotocin-in...	2015	BMC complementary ...
7.00	606	N Förster, C Ulrichs, M Schreiner, CT Müller, ...	Development of a reliable extraction and quantification method for glucosinolates in Moringa oleifera	2015	Food chemistry
2.00	776	T Kivevele, Z Huan	... contaminants and antioxidant additives on storage stability of biodiesel produced from non-edible oils of Eastern...	2015	Fuel
5.00	449	A Leone, A Spada, A Battezzati, A Schiraldi...	Cultivation, genetic, ethnopharmacology, phytochemistry and pharmacology of Moringa oleifera leaves: An overview	2015	International journal of ...
2.00	821	CM Silva, PF Martins, MMR de Melo	Techno-economic optimization of the supercritical fluid extraction of Moringa oleifera seeds for the production of b...	2015	J. Supercrit. Fluids
2.00	774	PI Zvinorova, L Lekhanya, K Erlwanger...	Dietary effects of Moringa oleifera leaf powder on growth, gastrointestinal morphometry and blood and liver meta...	2015	Journal of animal ...
3.00	545	AA Warra	Production of Soap From An Indigenious' Moringa oleifera'LAM SEED OIL	2015	Journal of Raw Materials Research
1.00	887	M Mofijur, HH Masjuki, MA Kalam, MG Rasul...	Effect of Biodiesel-diesel Blending on Physico-chemical Properties of Biodiesel Produced from Moringa Oleifera	2015	Procedia ...
3.00	536	AK Azad, MG Rasul, MMK Khan, SC Sharma...	Prospect of Moringa seed oil as a sustainable biodiesel fuel in Australia: a review	2015	Procedia Engineering
1.00	1000	AG Landa, LB Zapata, GC Flores...	Acción Antimicrobiana de la Pterigospermina de Moringa Olífera sobre los Contaminantes del Agua y su Efecto en el...	2015	Revista Electrónica de la ...
2.00	788	MM Rady, GF Mohamed	... on the growth, physio-chemical attributes and yields of Phaseolus vulgaris L. plants by the combined application ...	2015	Scientia Horticulturae
2.00	711	JR Barajas, S Pagsuyoin	Development of a low-cost water treatment technology using Moringa oleifera seeds	2015	Systems and Information ...
7.00	448	M AamirIqbal, NA AsifIqbal, RN Abbas, HZ Kh...	Response of canola to foliar application of moringa (Moringaolifera L.) and brassica (Brassica napus L.) water extra...	2014	
6.00	791	AB Batista, JTA Oliveira, JM Gifoni, ML Pereira...	New Insights into the Structure and Mode of Action of Mo-CBP 3, an Antifungal Chitin-Binding Protein of Moringa ol...	2014	
3.00	595	D Oz	Moringa news, articles and information: Moringa: A miracle tree being promoted as a solution to third world malnutr...	2014	
3.00	722	DW Gakuya, PN Mbugua, B Kavoi, SG Kiama	Effect of supplementation of Moringa oleifera leaf meal in broiler chicken feed	2014	
13.00	258	HD Yassa, AF Tohamy	Extract of Moringa oleifera leaves ameliorates streptozotocin-induced Diabetes mellitus in adult rats	2014	Acta histochemica
1.00	920	R Ghodsi, HM Sadeghi, G Asghari...	Identification and cloning of putative water clarification genes of Moringa peregrina (Forssk.) Fiori in E. coli Xl1 blue...	2014	Advanced biomedical ...
1.00	930	R Ghodsi, HM Sadeghi, G Asghari...	Identification and cloning of putative water clarification genes of Moringa peregrina (Forssk.) Fiori in E. coli Xl1 blue...	2014	Advanced biomedical ...
5.00	571	PM Aja, N Nwachukwu, UA Ibiam, IO Igwenyi...	Chemical Constituents of Moringa oleifera Leaves and Seeds from Abakaliki, Nigeria	2014	Advanced Journal of ...
2.00	648	EN Ali	Biosorption of Cd (II) from water by Moringa oleifera Leaves	2014	Advanced Materials Research
9.00	603	S Bais, GS Singh, R Sharma	Antiobesity and hypolipidemic activity of Moringa oleifera leaves against high fat diet-induced obesity in rats	2014	Advances in Biology
16.00	167	B Moyo, PJ Masika, V Muchenje	Antimicrobial activities of Moringa oleifera Lam leaf extracts	2014	African Journal of Biotechnology
5.00	598	MA Iqbal	... growth and yield of canola (Brassica napus L.) with seed treatment and foliar sprays of Brassica (Brassica napus...	2014	Agric. Environ. Sci
2.00	728	JO Animashaun, AA Toye	Feasibility analysis of leaf-based moringa oleifera plantation in the nigerian guinea savannah: case study of univer...	2014	Agrosearch
2.00	812	S Sankhalkar	Antioxidant enzyme activity, phenolics and flavonoid content in vegetative and reproductive parts of Moringa oleif...	2014	Am J Pharmatech Res
2.00	656	M McKnight, J Allen, JD Waterman...	Moringa tea blocks acute lung inflammation induced by swine confinement dust through a mechanism involving TNF...	2014	American Journal ...
4.00	590	KM Sadek	Chemotherapeutic efficacy of an ethanolic Moringa oleifera leaf extract against chromium-induced testicular toxicit...	2014	Andrologia
3.00	946	MF Houndonougbo, CA Chrysostome...	Fourrages de Moringa oleifera et de Gliricidia sepium utilisés comme compléments alimentaires efficaces pour nourri...	2014	Annales des Sciences ...
3.00	557	A Ologhobo, EI Akangbe, IO Adejumo...	Effect of moringa oleifera leaf meal as replacement for oxytetracycline on carcass characteristics of the diets of br...	2014	Annual Research & ...
4.00	783	D Singh, PV Arya, VP Aggarwal, RS Gupta	Evaluation of Antioxidant and Hepatoprotective Activities of Moringa oleifera Lam. Leaves in Carbon Tetrachloride-...	2014	Antioxidants
3.00	607	SN Hlophe, NAG Moyo	A comparative study on the use of Pennisetum clandestinum and Moringa oleifera as protein sources in the diet of ...	2014	Aquaculture International
2.00	657	WM Salama, AS Salem, ET Yousef	Development of innovative beverage based on milk permeate fortified with dried leaves of Moringa oleifera.	2014	Arab Universities Journal of ...

Fig. 6. Results obtained from PoP. Data sorted by decreasing publication years.

6. Analysis of data from the worldpatent database

The Chinese patents [11] which were almost none before 2012 increase dramatically during the last three years. See the following figure. This is a good indication of the strategy develop in China about the uses of Moringa. Since no Chine patents are extended as

Authors sorted by alphabetical order	Journal of publication (alphabetical order)
A Adedapo, O Falayi, A Oyagbemi	3 Biotech
A Adedapo, O Falayi, A Oyagbemi	AAPS PharmSciTech
A Adu-Gyamfi, M Tahiru	AAPS PharmSciTech
A Ali, N Akhtar, AM Mumtaz, MS Khan...	Acad arena
A Babatunde, M Ikechuwkwu, O Odeyemi	Acad J Med Plants
A Bhatnagar, AG Krishna	Academic Journal of Entomology
A Bhattacharya, D Agrawal, PK Sahu, S Kum...	Acta histochemica
A Bukar, A Uba, T Oyeyi	Acta Scientiarum. ...
A Bukar, A Uba, TI Oyeyi	Acta Scientiarum. ...
A Buker, A Uba, TI Oyeyi	Adv Appl Sci Res
A Castillo, C Castillo, JB Ramírez, L Ávilas, R ...	Adv Pharmacol Toxicol
A Chakraborty, DK Das, M Sinha, S Dey...	Advance Journal of ...
A Damayanti, Z Ujang, MR Salim	Advanced biomedical ...
A De Saint Sauveur, M Broin	Advanced biomedical ...
A Dey, SS Paul, P Pandey...	Advanced Journal of ...
A Ejigu, A Asfaw, N Asfaw, P Licence	Advanced Materials Research
A Eman N, M Suleyman A, S Hamzah M...	Advances in ...
A Gupta, MK Gautam, RK Singh, MV Kumar, C...	Advances in Animal ...
A Hermawan, KA Nur, D Dewi, P Putri...	Advances in Applied Science Research
A Jayanegara, T Sabhan, AK Takyi...	Advances in Biology
A Kaboré, B Savadogo, F Rosillon, AS Traoré...	Advances in Chemical ...
A Kardam, KR Raj, JK Arora, MM Srivastava...	Advances in environmental ...
A Kawo, B Abdullahi, A Halilu, Z Gaiya, M Dab...	Advances in Plants & Agriculture Research
A Leone, A Spada, A Battezzati, A Schiraldi...	Afr J ...
A Maurya, S Gupta, SK Srivastava	Afr J Biotechnol
A Melesse	Afr J Microbiol Res
A Melesse	Afr J Pharm ...
A Melesse, H Steingass, J Boguhn, M Scholle...	Afr J Pharm Pharmacol
A Melesse, H Steingass, J Boguhn...	Afr. J. Plant Sci
A Melesse, W Tiruneh...	African health sciences
A Melesse, Y Getye, K Berihun, S Banerjee	African J. Biotechnol
A Misra, S Srivastava, M Srivastava	African Journal of ...
A Mohammed, SH Mohammad, EHC Mohamm...	African Journal of ...
A Montakhab, AH AbdulHalim Ghazali, MM Jo...	African Journal of ...
A Mumuni	African Journal of ...
A Nardos, E Makonnen, A Debella	African Journal of ...
A Oloqhobo, EI Akanqbe, IO Adejumo...	African Journal of ...

Fig. 7. Authors and journals of publication.

WO or EP patents It seems that China close the door to the extension of foreign patents by protecting widely its domestic market (see Tables 10–15 and Figs. 8–10).

7. Comparisons

The comparison between the three first academic sources of data, indicates that almost none of the universities and authors present in the academic databases are present in the worldpatent database.

May be some authors and their institutions could be present in their relevant national database, but a test with the Brazilian database was not positive.

The numbers of scientific articles dealing with various aspects of water cleaning as well as metals and heavy metal adsorption are very large but this is not the same way for patents. The theme is there, but the number of patents involved is small. This indicated in the following table. This difference is due to the fact that an invention to be protected must be necessary new and not published elsewhere. Then another question to ask is if it is worthwhile to spend so much time in academic research on already know areas (see Table 16).

Patent information is also is of course most oriented to application, and many patents deal with “processing”, “manufacture of”, “production of”, but the subject is finely described and this is very interesting in the field of academic research valorization. This “hot topic” is interesting to create a virtuous cycle: the state money finance the universities and research centers, where knowledge is created. Then this knowledge can be transformed in products and services to “make money”, which can be for part of it re-invested in research.

Let us note also that in the domain “extract” the Chinese patents are important as well as the US and KR patents. This may indicated for academic researchers that this topic is of interest and that niches or news orientations could be found different from the techniques protected described in the above patents. This example

Table 10
The main inventors.

Inventors	Freq.
Liu Lei	8
Hu Sheng	7
Li Feng	5
Tang Guoping	5
Zhao Shengfu	5
Poppe ElisAbeth (DE)	4
Empty Field	4
Flores Eva N (PH)	4
Liu Xiangyi	4
Liu Jianxiang	4
Gao Zheng	4
Yang Shuyun	4
Gu Wenhong	4
Kleen Astrid (DE)	3
Ma Zhigang	3
Qiongfen Duan	3
Liyi MA	3
Youqiong Wang	3
Zhongquan Zhang	3
Liu Xi	3
Rao Guohua	3
Zhao Ruifeng	3
Liu Xuesong	3
Liu Fuli	3
Ding Hui	3
Du Wei	3
Zhou Shimin	3
Jiao Jialiang	3
Li Xing	3
Qiu Zhi	3
Zhang Kechi	3

Table 11
Number of patent per priority year.

Years	Freq.
2015	62
2014	102
2013	95
2012	22
2011	22
2010	11
2009	8
2008	8
2007	6
2006	7
2005	8
2004	12
2003	7
2002	8
2001	8
2000	2
1999	2
1998	2
1994	1

shows how patent literature can help research to “optimize” their knowledge and competencies by moving to new and enhanced value subjects.

We examined the references of a certain number of academics paper dealing with Moringa, either from the WoS or Medline or Google Scholar. None of this articles cited in their references patents relevant to the topic of the research! This shows that most of the time the academics did not care for patents information. This is a pity since the patent information indicates the orientations in applied research and indicates the applicant(s) concerned. For instance in patent information it is easy to retrieve the group of patents dealing with “cosmetic”, and analyze it. The following table

Table 12
Main Universities as applicant.

Universities	Freq.
Bicol University (PH)	3
Univ Tianjin (CN)	3
Univ Fujian Agric & Forestry (CN)	2
Univ Kyung Hee Univ Ind Coop (KR)	1
Nat Univ Pukyong Ind Univ Coop (KR)	1
Univ Silla (KR)	1
Cagayan State University (PH)	1
Cebu Technological University San Francisco Campus (PH)	1
Univ Rutgers (US)	1
Univ Chongqing Normal (CN)	1
Univ North China Water & Resou (CN)	1
Univ Nanjing Forestry (CN)	1
Univ Panzhihua (CN)	1
Univ South China Agricult (CN)	1
Univ Yunnan Agricultural (CN)	1
Yunnan Plateau Characteristic Agricultural Industry Res Inst (CN)	1

Table 13
Main IPC4s [10].

IPC4	Freq.
A61K	91
A61P	54
A61Q	41
A23L	38
A23F	28
A23K	20
A01G	17
A21D	13
A23C	13
A01N	11
C05G	11
C02F	9
A23G	8
A23P	7
C12G	7
C11D	6
C07H	5
C12N	5
A23D	5
C11B	5
A01P	5
A24D	4
A01C	4
B01D	3
C05F	3
A24B	3
A01H	3
C12R	3
C07D	3

Table 14
Main IPC3s.

IPC4	Freq.
A61	186
A23	122
A01	24
A01	16
C05	14
A21	13
C11	11
C02	9
C12	12
C07	8
A24	7
B01	3
C12	3

Table 15
Meaning of the IPC3s in human necessities.

A	Human necessities
Agriculture	
A01	Agriculture; forestry; animal husbandry; hunting; trapping; fishing
Foodstuffs; tobacco	
A21	Baking; edible doughs
A22	Butchering; meat treatment; processing poultry or fish
A23	Foods or foodstuffs; their treatment, not covered by other classes
A24	Tobacco; cigars; cigarettes; smokers' requisites
Health; amusement	
A61	Medical or veterinary science; hygiene
A62	Life-saving; fire-fighting
A63	Sports; games; amusements

US and EP patents is interesting because that will give some research orientations able to be interesting for partnerships for instance. Here is an example of the "non patent" literature for the group cosmetic (see Table 18).

Another way to use the patent literature for academics is very simple. For instance you may take the title of an academic article and use all the words to search the worldpatent database. Example:

Title and reference of the article:

Biochemical and functional properties of Moringa Oleifera leaves and their potential as a functional food, Global Advanced Research Journal of Agricultural Science (ISSN: 2315–5094) Vol. 4 (4) pp. 188–199, April 2015. Article available from Google Scholar

	univ	PR=US	PR=FR	PR=CN	PR=JP	PR=TW	PR=MX	PR=GB	PR=IN	PR=CA	PR=OA	PR=ZA	PR=KR	PR=DE	PR=CH	PR=ES
PN=EP		6	3					2	1					5	1	1
PN=WO	2	10	4					8	6		2	1	3	6	1	
Main inventors	4	8		65				5					4	7		
main PR years	21	22	3	252	12	1	1	9	12	1	2	2	22	11	2	1
main IPC4	14	16	4	171	10			9	9		2	1	17	11	1	

Fig. 8. Priority countries, extension in EP and WO.

indicates the various companies involved in that field (see Table 17).

From the names of the companies, it is possible to move to various other patents and get more information, etc. For academic researchers, the analysis of the "non patent" literature for the WO, https://www.researchgate.net/profile/Gamal_Hamad2/publication/275651298_Biochemical_and_functional_properties_of_Moringa_oleifera_leaves_and_their_potential_as_a_functional_food/links/5543a9870cf23ff716852087.pdf.

The bibliography of this article (36 references) does not contain Patent reference.

Patent search: ("moringa leaves" or "moringa leaf") and "functional food".

Patent retrieve

	main IPC4	coagulant	extract	metal extract	leaf	root	bark	seed	antibacterial	antiinflammatory
univ	14		11		5	1		1	2	1
PR=US	16		15		6	2	2	7	2	2
PR=FR	4		4					2	1	
PR=CN	171	1	65	4	89	25	5	83	14	2
PR=JP	10		7		3	1		5	1	
PR=TW						1		1		
PR=MX			1							
PR=GB	9		6					3		
PR=IN	9		5		1	1	1	1	1	2
PR=CA			1							
PR=OA	2		2			1	1	1		
PR=ZA	1									
PR=KR	17	4	16	2	4			7	3	
PR=DE	11		9			1		3		
PR=CH	1	1	1					2		
PR=ES			1		1	1				

Fig. 9. Priority counties and strategic groups.

	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
univ	4	9	9	1												
PR=US	1	1	2	3	7	2		2	2	3	3	1	4	2	2	1
PR=FR						1	1						1	2	1	
PR=CN	59	92	68	13	6	2	3	2		3	2	2				
PR=JP		1	2	2	4							3				1
PR=TW					1											
PR=MX					1											
PR=GB			1	3	5	1						1		1	1	
PR=IN		4	1			1	1		1			2	1			1
PR=CA												1				
PR=OA					1										1	
PR=ZA				1									1			
PR=KR	1	2	9	2	1	4	1	2								
PR=DE					1		2	1	3	1	3	2				
PR=CH														2	2	
PR=ES			1													

Fig. 10. Numbers of patents per year per priority countries.

Table 16
Priority countries and strategic groups.

Strategic groups	Univ	PR=US	PR=FR	PR=CN	PR = JP	PR = TW	PR = MX	PR = GB	PR=IN	PR=CA	PR=OA	PR = ZA	PR=KR	PR = DE	PR=CH	PR = ES
Water treatment													1			
Coagulant				1									4		1	
Extract	11	15	4	65			1	6	5	1	2		16	9	1	1
Metal extract				4									2			
Leaf	5	6		89	3				1				4			1
Root	1	2		25	1	1			1		1		0	1		1
Bark	0	2		5					1		1		0			
Seed	1	7	2	83	5	1		3	1		1		7	3	2	
Antibacterial	2	2	1	14	1				1				3			
Antiinflammatory	1	2		2					2							

Table 17
Applicants involved in cosmetics.

Applicants	Frq.
Henkel AG & Co KGAA (DE)	8
Ae kyung Ind Co Ltd (KR)	2
Henkel KGAA (DE)	2
Morechem Co Ltd (KR)	1
Univ Kyung Hee Univ Ind Coop (KR)	1
Amorepacific Corp (KR)	1
Univ Rutgers (US)	1
Ben S Lab Co Ltd (KR)	1
Int Flora Technologies Ltd	1
Serobiologiques Lab Sa (FR)	1
Revlon Consumer Prod Corp	1
Feixi County Yandian Village Grain & Oil Co Ltd	1
Pu Er Huaqiang Biolog Technology Co Ltd	1
Arche Cosmetics Co Ltd	1
Zhanjiang Tongling Medical and Biolog Engineering Co Ltd	1

CN102920754A Moringa Leaf Extract and Application of Moringa Leaf Extract in Aspect of Effect Enhancement and **Toxicity Reduction For Chemotherapy or Radiotherapy of Cancers**.

The invention discloses a **Moringa leaf extract** and an application of the Moringa leaf extract in the aspects of effect enhancement and toxicity reduction for chemotherapy or radiotherapy of cancers. Dry Moringa leaves are extracted through 20%–80% ethanol aqueous solution the amount of which is 3–10 times of the weight of the dry Moringa leaves, concentrated and dried so as to obtain the Moringa leaf extract. The Moringa leaf extract which is extracted through the method has the functions of effect enhancement and toxicity reduction for chemotherapy or radiotherapy of cancers, and can be used for producing various auxiliary anti-cancer medicaments, **functional food** and food.

The patent retrieved indicates that Moringa leaf extract can be used as functional food, but presents also properties useful in Chemotherapy and Radiotherapy of cancers. This may be a source of re-orientation of the academic research or at least an enhanced presentation.

One more example

Hypotensive Activity of Moringa oleifera Lam (Moringaceae) Root Extracts and its Volatile Constituents, Tropical Journal of Pharmaceutical Research May 2015; 14 (5): 823–830 http://www.tjpr.org/admin/12389900798187/2015_14_5_12.pdf.

The bibliography of this article does not contain patent reference,

Patent search: moringa and 'blood pressure". The formulation of the search needs some experience since the patent vocabulary is

Table 18
Example of "non patent" literature useful in fundamental research.

Patent	Non patent literature cited by the examiner
WO9948512A1 use of at least one protein extract of the moringa genus plant seeds and corresponding cosmetic and/or pharmacological composition	No. 6 Rico magda: "Moringa:a health-giving water-purifying vegetable" Food marketing & technology vol. 8 Décembre 1994pages 10–11
WO2015066339A1 extracts from plants of the moringaceae family and methods of making	Pages 55–61 Journal of medicinal plant research vol. 42 Eilert et al.: "The antibiotic principle of seeds of moringa oleifera and moringa" Stenopetala. Padla et al.: "Antimicrobial isothiocyanates from the seeds of moringa oleifera lam." Z. Naturforsch. Vol. 67C pages 557–564 Mbikay.: "Therapeutic potential of moringa oleifera leaves in chronic hyperglycemia and dyslipidemia: A review." Front. Pharmacol. vol. 3 NO. 24 pages 1–12
WO2014193031A1 antimicrobial agent having moringa oleifera extract captured in porous zinc oxide and preparation method therefore	No. 1 Therapeuticbukar A. et al.: 'ANtimicrobial profile of moringa oleifera lam. extracts against some food-bome microorganisms.' Bayero journal of pure and applied sciences vol. 3 01 June 2010 pages 43–48 Fahey J. W.: 'Moringa oleifera: A review of the medical evidence for its nutritional and prophylactic properties. Part 1.' Phytochemistry vol. 47 01 December 2005 Pages 123–157
WO2006032374A1 farbverändernde mittel mit moringa extrakt color-modifying agents comprising moringa extract	Mai 2003 (2003–05) Seiten 7-14 [Online] 15. November 2005 (2005-11-15) Armand-Stussi I et al. Cognis Corp. USA: "An interesting source of moringa oleifera - active ingredients for skin and hair care" Personal care XP002354306 [GEFUNDEN AM 2005-11-15] NN: "Puricare tm - the new "2 IN 1" ANti-stress anti-pollution for hair" Laboratoires serobiologiques Seiten 1–2 XP002354308 gefunden im internet: url:http://www.laboratoires-serobiologiques.com/pdf/mp_puricare_en.pdf> [GEFUNDEN AM 2005-11-15]

CN104862201A	**Moringa oleifera and peony health care wine and preparation method thereof** 2015-08-26 LI JIE [--]
CN104830618A	**Preparation method of moringa oleifera health wine** 2015-08-12 PUER HUAQIANG BIOTECHNOLOGY CO LTD [--]
CN104814445A	**Cardio-cerebrovascular disease preventing intensified protein powder and preparation method thereof** 2015-08-05 LIANG DEHUA [--]
CN104687060A	**Moringa oleifera lam. product rich in gamma-aminobutyric acid (gaba) and processing technology and application thereof** 2015-06-10 UNIV YUNNAN AGRICULTURAL [--]
CN104548004A	**Plant fruit essence with functions of treating high blood sugar, high blood fat, high blood pressure and heart diseases, as well as cosmet** 2015-04-29 LIU SHUPING [--]
CN104489189A	**Moringa tea and preparation method thereof** 2015-04-08 YUNNAN LONGRUN TEA GROUP CO LTD [--]
CN104432082A	**Moringa oleifera and blueberry health-care buccal tablet** 2015-03-25 LIU XIANGYI [--]
CN104171836A	**Health-care flour capable of preventing pharyngitis and preparation method thereof** 2014-12-03 SUZHOU JINSUI FLOUR INDUSTRY CO LTD [--]
PH12013000032A1	**Herbal formulation for the control of diabetes, hypertension, heart and prostate conditions, infections and the enhancement of the imn** 2014-08-27 ATIL SUNGAHID ONESIMO [PH]
CN103947949A	**Hibiscus manihot flower-konjak rice cake and processing method thereof** 2014-07-30 GUI YUPING [--]
CN103636704A	**Method for manufacturing shelled melon-seed walnut cake for lowering blood pressure** 2014-03-19 YANG RUQIN [--]
CN103535607A	**Bone soup steamed bread and preparation method thereof** 2014-01-29 ANHUI HUAIYUAN XINTAI CEREAL & OIL CO LTD [--]
CN103445071A	**Pumpkin leaf healthcare noodles and processing method thereof** 2013-12-18 ANHUI JIAXIAN RICE CO LTD [--]
CN103229801A	**Health-care biscuit containing chicken bone and bitter gourd and preparation method thereof** 2013-08-07 XUE CHAOGUI [--]
CN103039791A	**Pressed candy with functions of adjusting and improving human endocrine system and preparation method thereof** 2013-04-17 TIANJIN PEIYANG BIOTRANS BIOTECH CO LTD [--]
CN1903278A	**Pure natural nutrient substance and its prepn. method** 2007-01-31 YUN NAN PROV TROPICAL CROPS SC [CN]

Fig. 11. Moringa and "blood pressure".

sometimes different that the academics.

The results are indicated in the following figure (see Fig. 11):

8. Conclusion

The presentation of the Moring works in academics and technological fields shows how it is possible to bridge the gap between academics and technological research. Analysis of relevant scientific information and technological information (using relevant codes or strategic groups build up by the user(s)), allows to detect strategic patents or strategic scientific papers. The scientific articles do not mention patent in their bibliography, but using some words from the titles of the articles as research items it is possible to retrieves some relevant patents which will enhance the subjects of the articles.

Patents dealing with Moringa give the names of institutions, researchers, companies, working in the field as well as the techniques and products protected. This information may be very valuable when academic researchers are answering or making research proposals. Other correlations such as the trend of development per year indicated the interest of the subject. An analysis in depth of the applicant field detects the new entrants but also the universities and research centers involved in this area of applied research. This can be key information for academics.

All the analysis present in this article underlines the role of bibliometrics in research programming and research valorization or for the ongoing research road mapping [13]. Today, one of the most important steps in innovation is to use the knowledge build up in research institutions to develop industrial products able to satisfy the customers [14]. Bibliometrics analysis and APA (Automatic Patent Analysis) seem to be one of the best ways to detect such opportunities [15–17].

References

[1] Multipurpose Tree, 2015. http://en.wikipedia.org/wiki/Multipurpose_tree (accessed October 2015).

[2] B.E. Dale, Greening' the chemical industry: research and development priorities for biobased industrial products, J. Chem. Technol. Biotechnol. 78 (10) (2003) 1093–1103.

[3] Matheo Analyzer, 2015. http://www.matheo-software.com (accessed October 2015).

[4] Access to Pubmed http://www.ncbi.nlm.nih.gov/pubmed/advanced consulted January 2016.

[5] PoP Pub lish or Perish, 2016. http://www.harzing.com/resources/publish-or-perish (accessed January 2016).

[6] Patent Pulse, 2016. http://www.patent-pulse.com (acessed May 2016).

[7] S. Hinze, U. Schmoch, Opening the black box, in: H.E. Moed, W. Glänzel, U. Schmoch (Eds.), Handbook of Quantitative Science and Technology Research, Kluwer academic Publishers, NY, London, 2004, pp. 218–219.

[8] US Patent Fulltext Access, 2016. http://patft.uspto.gov/netahtml/PTO/search-adv.htm (accessed January 2016).

[9] Medical Subject Heading – Definition, 2015. http://www.nlm.nih.gov/pubs/factsheets/mesh.html (accessed October 2015).

[10] International Patent Classification, 2016. http://worldwide.espacenet.com/classification?locale=fr_EP (accessed January 2016).

[11] H. Dou, X. Hongxia, The role of Patent Information in the development of the innovative SMEs. A focus on Chinese Patents, Rev. Int. d'Intelligence Econ. (R2IE) 4 (2013) 187–203.

[13] B.L. Bruce, in: Allyn 8c Bacon (Ed.), Qualitative Research Method for Social Science, 2004. https://sisis.rz.htw-berlin.de/inh2012/12424693.pdf. consulted October 2014 (accessed October 2015).

[14] P. Cooke, The role of research in regional innovation systems: new models meeting knowledge economy demands, Policy Organ. Manag. Technol. Manag. 28 (2004) 507–533. http://inderscience.metapress.com/content/qk8q64dbbkd6n5xk/, 2015 (accessed October 2015).

[15] U.M. Fayyad, A. Wierse, G.G. Grinstein, in: Morgan Kaufmann (Ed.), Information Visualization in Data Mining and Knowledge Discovery, 2002.

[16] A.L. Porter, S.N. Cunningham, in: Techmining: Exploiting New Technologies for Competitive Advantage, John Wiley & Sons, Inc, 2005.

[17] Henri Dou, Sri Damayanty Manullang, Jacky Kister, Dou Jean-Marie, Automatic

patent analysis used to improve innovation and development in developing countries, Br. J. Appl. Sci. Technol. 7 (3) (2015) 237–252.

Henri Dou, Engineer, made his doctorate in the field of Organic Chemistry partly in Canada. After a career at the CNRS as Research Director, he joined the University of Aix Marseilles as Professor of Information Science and he developed the first French cursus in Technology Watch as well as various diplomas DU, DESS, DEA, Master, PhD in the field of Competitive Technical Intelligence, Regional Development and Bibliometrics and strategic development and innovation. He is today consultant for the World Bank, the WIPO, the OAPI and the EU, expert of the Franco-Chinese Association of CI, President of the French Society of Applied Bibliometrics, External Member of the CESER (Conseil Economique Social et Environnemental PACA) and Manager of the Matgheo Software company. He is also a Member of various editorial boards of Scientific journals. He is specialized in CI, APA (Automatic Patent Analysis), Regional Development and SRR (Social Research Responsibility). http://www.ciworldwide.org.

Jacky Kister is a Chemical Engineer of IPSOI, PhD in Chemical Sciences and graduated from the IAE of Aix en Provence (Enterprise management). He became Director of Research at the CNRS in 1990 and from 1998 to 2007 he was the Director of the Complex Chemical System Laboratory affiliated to the French National Research Center and located to the Aix-Marseille University. Jacky Kister has a double competency in Chemistry and Information Science applied to industrial development and Private and Public Partnerships. He now work as a consultant to develop innovative research management in academic laboratories and he is also the Secretary of the non-profit association “ADER Mediterranée” (Association for the Development and financial management of Research).