Biodiversity in the Patent System: South Africa

A country study of genetic resources and traditional knowledge in the patent system of relevance to South Africa

Prepared for:

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

July, 2013

Authors

Paul Oldham
Colin Barnes
Stephen Hall

One World Analytics is a trading name of POMC Consulting Ltd. UK.

Introduction

This report presents the results of analysis of patent activity for genetic resources and traditional knowledge from South Africa. The report is divided into three sections:

Section 1 provides an overview of biodiversity in South Africa based on information from the Global Biodiversity Information Facility and introduces the patent data.

Section 2 provides a general overview of patent activity for species known to occur in South Africa in the period 1976-2010. This is followed by detailed analysis of patent documents that make reference to South Africa and data based on species that are limited to distribution in South Africa.

Section 3 provides a set of short summaries for species that are a focus of patent activity. This information will also be made available online for further research through the Access and Benefit Sharing Patent Index (ABSPAT).[1]

The report was prepared using large scale text mining of patent data for species names and country names. This data was then combined with taxonomic information from the Global Biodiversity Information Facility. Additional patent research was conducted using the commercial Thomson Innovation database and processed using a variety of software tools.

Patents are an important indicator of investments in research and development directed to the development of commercial products. The aim of the report is to identify potential opportunities for economic development in support of conservation by identifying existing research and development involving species from South Africa. The research did not investigate the terms and conditions under which patent applicants obtained the genetic resources and traditional knowledge disclosed in the patent document. Therefore the report does not consider the problem of biopiracy or misappropriation of genetic resources and traditional knowledge.

The research was limited to searches of patent data from the United States, the European Patent Office and the international Patent Cooperation Treaty in the period 1976-2010. As such, the research is limited to the major patent offices for this period. We do not consider patent activity prior to 1976 or after 2010 except through patent family information and citation data. As such the report provides a baseline for patent activity involving species from South Africa as a basis for further research.

Our research focused primarily on documents that make reference to South Africa and to cases where existing distribution data suggests South Africa is a likely source for the species. This imposes two limitations on the research. First, we focus on identifying species that are a focus of existing research and development. However, the report does not seek to provide the complete global patent landscape for an individual species. Second, because we focused on identifying species from a country we did not search patent data for references to regions (i.e. Africa) or sub-regions (i.e. Southern Africa) in the patent data. To address this issue we deliberately highlight cases where a species is distributed in more than one African country.

[1] ABSPAT is available at http://www.abspat.net

This report is one in a series of reports on patent activity for species from African countries. The following observations are based on the research for the six African country reports to date and form the main recommendations arising from the research.

Taxonomic Research:

1. There is a need to improve the availability of taxonomic information for each country. In the absence of taxonomic information it is not possible to identify genetic resources that are relevant to a particular country in patent data and any relevant opportunities for economic development. African countries could consider giving greater priority to taxonomic research and making taxonomic information available through GBIF;
2. Georeferencing of the coordinates for the locations of species is an important standard in modern biodiversity research. Georeference data can be used to identify where species have been recorded in a country and also where biodiversity research has been concentrated. In our view georeferencing is an underutilized tool for identifying where species are located as a basis for engaging with indigenous and local communities to consider potential development opportunities. We recommend greater attention to georeferencing and its use for engagement with relevant indigenous and local communities;
3. Taxonomic research does not attract investment because it appears to be remote from economic considerations. In practice taxonomic information is vital to identifying opportunities for development that is supportive of the objectives of the Convention on Biological Diversity and its Nagoya Protocol.
4. Taxonomic information is also important for the capacity of countries to monitor compliance with the Nagoya Protocol by improving baseline data on the species within a country. Advancing knowledge and understanding of biodiversity and the traditional knowledge of indigenous and local communities has an important role to play in long term monitoring under the Nagoya Protocol.

The Patent System:

1. Patent documents are frequently unclear on the precise origin or source of genetic resources and associated traditional knowledge. In addition very limited information is available on the terms and conditions of acquisition of genetic resources and traditional knowledge. This could be improved through enhanced disclosure of origin measures as advanced by the African Group and discussed in greater detail elsewhere;[2]
2. Species are commonly distributed in more than one country. It is important that African countries include requirements in access and benefit sharing agreements to clearly specify the source of genetic resources and associated traditional knowledge in any patent applications that may arise under the terms of an agreement. When combined with the enhanced disclosure measures noted above this would greatly improve capacity to monitor patent activity under the terms of the Nagoya Protocol;
3. One of the major issues that emerged in the research is the problem of *essential incorporation* of species into patent claims. Patent applicants frequently list very large numbers of species, or make reference to genera and families, with the purpose of incorporating all members of a genus or family into the scope of the patent claims. Typically these applications did not involve collection or use of many of the species that are listed. The aim of essential incorporation is to prevent others from using compounds, extracts or ingredients from these species in similar inventions or products. Where granted these patents are likely to have negative consequences for researchers

[2] Oldham, P & Burton G (2010) *Defusing Disclosure in Patent Applications*. UNEP/CBD/COP/10/INF/44

and producers in African countries seeking to develop and export similar products from these species. In our view, patent claims for components of organisms should be limited to the species from which the compound or extract was isolated by the applicants and not extend to members of the genus or entire families. Furthermore, in our view essential incorporation is anticompetitive and action should be considered to stop or severely restrict this practice.

4. In some cases patent activity may involve species that are vulnerable, endangered or CITES listed. In considering the possibilities for economic development identified in patent data it is also important to identify and assess the conservation status of the species concerned in order to support the objectives of the Convention on Biological Diversity.

Patents have frequently been viewed with suspicion within the biodiversity policy community as examples of the inequitable exploitation of resources from biodiversity rich developing countries. Our research demonstrates that patent data can also be turned to positive purposes to identify potential opportunities for economic development in Africa. We hope that this information will prove to be useful to African countries.

South Africa

Area:
1,219,090 sq. km
Coastline:
2,798 km
Climate:
Mostly semi-arid; subtropical along east coast; sunny days, cool nights.
Geography:
South Africa features a landscape dominated by a high plateau in the interior, surrounded by a narrow strip of coastal lowlands. The interior plateau consists of a series of rolling grasslands and rises abruptly to form a series of mountain ranges before dropping to sea level. In the north is a dry savanna subregion, known as the Bushveld. West of the Bushveld is the southern basin of the Kalahari Desert, which borders Namibia and Botswana.

Biodiversity in South Africa and Patent Activity:

Data for biological diversity for South Africa was obtained from the Global Biodiversity Information Facility (GBIF). GBIF provides open access to the most comprehensive data on species for a particular country that is presently available. All data is submitted by participating collections who share biodiversity information.

Using this resource we have obtained biodiversity records for species which occur in South Africa. It should be noted that the usefulness of this data in determining the actual distribution of a given species depends on the comprehensiveness of the data submitted by GBIF participants. Therefore we would stress that the absence of records should not be interpreted as indicating an absence of a given species, and similarly that a recorded species that only appears from one country should not be regarded as evidence of endemism. All reasonable efforts in identifying endemic species were made from alternative sources during the compilation of this report.

GBIF presently records 59,092 species names for South Africa. Of these 49,702 are accepted scientific names with the remainder made up of synonyms, homonyms or names that are not presently scientifically accepted. In addition, GBIF contains 10,306,146 georeferenced coordinates for species from South Africa. Accurate georeferencing of species collection records is an important standard in biodiversity related research. South Africa stands out for the number of georeferenced records for its species.

We identified a total of 275,517 documents containing species known to be distributed in South Africa. Of these 1,332 made some form of reference to South Africa. These documents were manually reviewed in MaxQDA software to identify documents specifying a source or origin in South Africa.

The 1,332 documents that made a specific reference to South Africa contained 6,415 species. As this suggests, many patent documents make reference to more than one species. The challenge therefore is to identify those species that originate from South Africa. These documents were manually reviewed in MaxQDA data analysis software. Through this process we were able to identify species where it was definitively stated that they had been collected, sampled or otherwise obtained from South Africa.

In addition, using GBIF distribution data we identified 325 species where GBIF presently records distribution only in South Africa. These species appeared in 2,648 patent documents where South Africa was not explicitly mentioned. The idea behind this was to identify cases where a species (based on available distribution data) was likely to have come from South Africa and thus be regarded as a species of likely or potential significance for South Africa. For the sake of simplicity we call this data ‘Distribution’. These documents were then selected for further review.

Biodiversity and Distribution

Much of the data submitted to GBIF includes geographical coordinates indicating where the recorded species was located. Using this data we are able to show the physical distribution across South Africa of all GBIF recorded species. Plate 1 shows two maps: The upper map shows plotted points, each indicating a GBIF record. The points are coloured to indicated the taxonomic kingdom of the species to which the record refers. It should be noted that this geographical information is raw data as submitted to GBIF by participating recorders. It has not been cleaned to remove any human errors when inputting to the GBIF database (an example of such an error might be where a longitudinal coordinate has been recorded as a + rather than a -). The lower map shows major settlements and roads, it also includes the location of some protected areas such as national parks and nature reserves - places expected to be of significance for biodiversity. A larger version of the distribution map can be found in the appendix of this country summary.

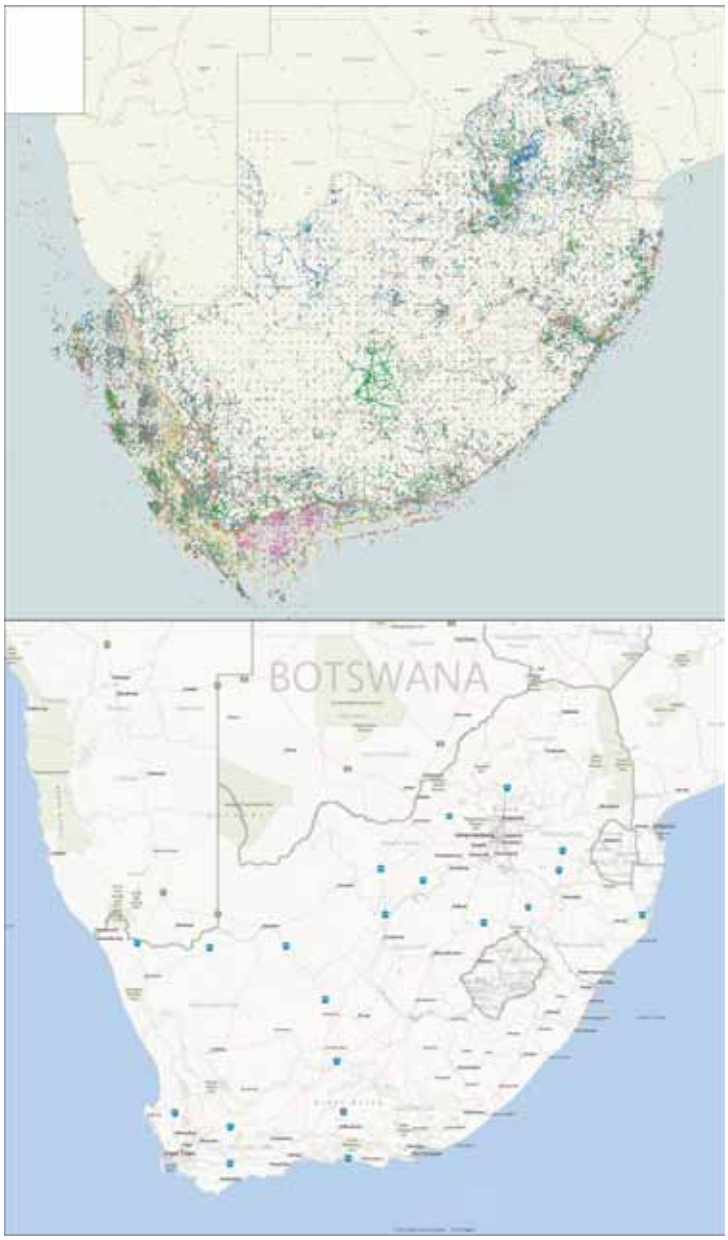
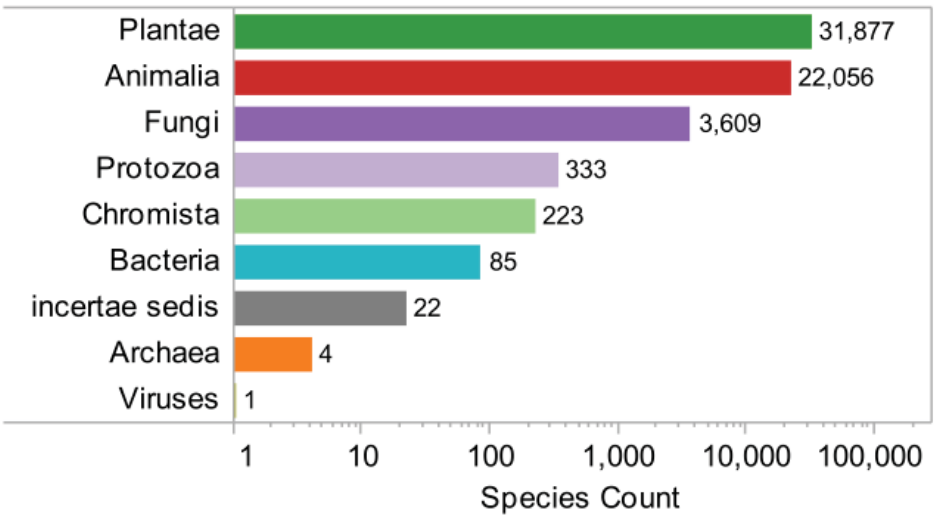


Plate1. Distribution of GBIF records from South Africa (upper map) and major settlements and roads (lower map) (map courtesy of Bing Maps). Each colour point represents a taxonomic kingdom for a given record.

It is very interesting to compare the two maps. There are a very large number of records for South Africa and this is likely to reflect the level of economic development when compared to other African countries. The data is distributed well across the country with very high densities of records clustered about the major areas of population density such as Cape Town, Durban and Pretoria; places where there will be industry and research establishments. Also the coastal lowlands appear well surveyed. Another feature of these mapped distribution records are the strings of data points which cross the country. When compared with the lower map it can be seen that these strings of data points closely follow the routes of major roads. Lesotho and Swaziland are surrounded by South Africa and likely to contain the same species as recorded around their borders. There are many records of marine species. The Cape is renowned for its biodiversity due to the convergence of major oceanic currents. Fisheries, though small in terms of national GDP are important for regional economies. They exist around the entire coastline and particularly off the Western Cape and this may explain the very large number of records from this ocean area.

GBIF presently records 59,092 names for species known to be present in South Africa. This list is dominated by plants and animals which account for 53,933, as can be seen in Table 1. Other kingdoms are well represented, and this, perhaps, illustrates a very high level of recording and collection.

Table 1: Showing the number of species in South Africa by kingdom using GBIF data.



Using global data it is possible to examine the wider distribution of South African species. Plate 2 shows where records exist across the globe for such species. Species which are found in two or more countries are referred to as being ‘cosmopolitan’. Each pie represents the number of occurrences of cosmopolitan species which are found in South Africa and is segmented by kingdom. It can be seen that South Africa appears to have many species which are endemic; the number of cosmopolitan species appears to be very small with only sub-Saharan and east Africa sharing significant numbers. This may be due to either the unique climate and habitats of South Africa or to the more complete catalogue of species recorded when compared to the relative paucity of records from other African countries. The number of species found beyond the African continent is very small indeed and it should additionally be noted that some of these records may originate from research institutions or collections and therefore do not represent native or naturalised distribution.

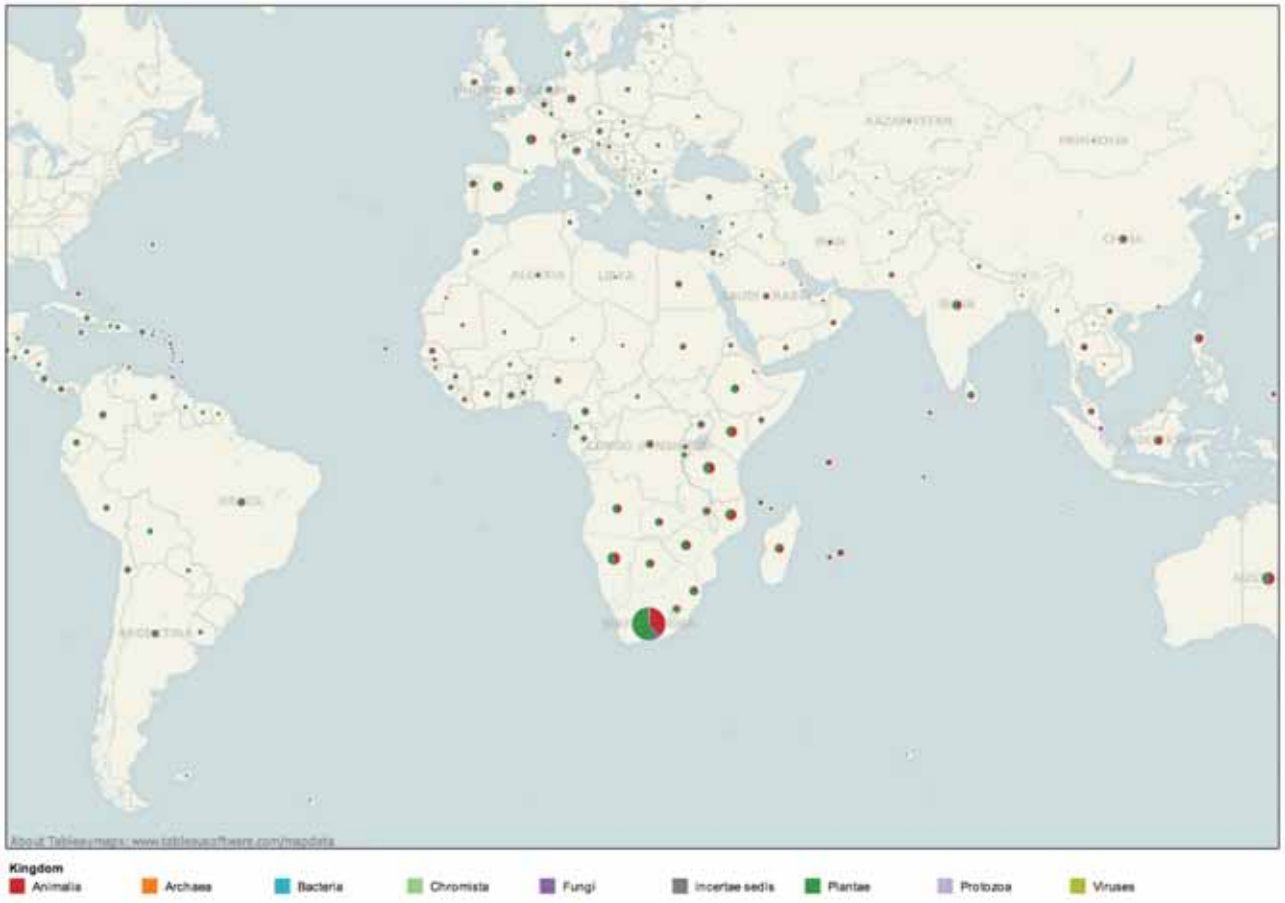


Plate 2: Global distribution of South African species shown by the number of occurrences in GBIF.

Biodiversity in South Africa in the Patent System

As of 2013 a total of 11,283 documents in the main patent jurisdictions (European Patent Office, the United States, and the Patent Cooperation Treaty) specifically mention South Africa. This provides a general overview of references to South Africa in the patent system across all areas of invention. Only a proportion of these documents will also refer to species collected in, or sourced from, South Africa. In addition, patent applicants will make reference to species that originate from South Africa but will not mention South Africa as the source of genetic resources or traditional knowledge.

Our aim in this section is to provide a brief overview of patent activity for genetic resources of relevance to South Africa. We focus on patent activity in the main patent jurisdictions in the period between 1976 and 2010. We then examine the results of research to identify genetic resources and traditional knowledge that originate from South Africa. In approaching patent activity for genetic resources from South Africa we focus on three categories of data.

1. Species that are known to be distributed in South Africa but are also distributed elsewhere in the world. This provides an overview of global patent activity for genetic resources of relevance to South Africa.
2. Species where a direct reference is made to the collection or origin of a species from South Africa. This data is based on a review of patents that make reference to a species known to be distributed in the country and the country name.
3. Species where available distribution data suggests that a sample is likely to have originated from South Africa. This data is known as Distribution data and refers to cases where GBIF presently only records a species as occurring in South Africa and no other country. Because taxonomic information is incomplete, this data provides a clue rather than proof that a species originated from South Africa.

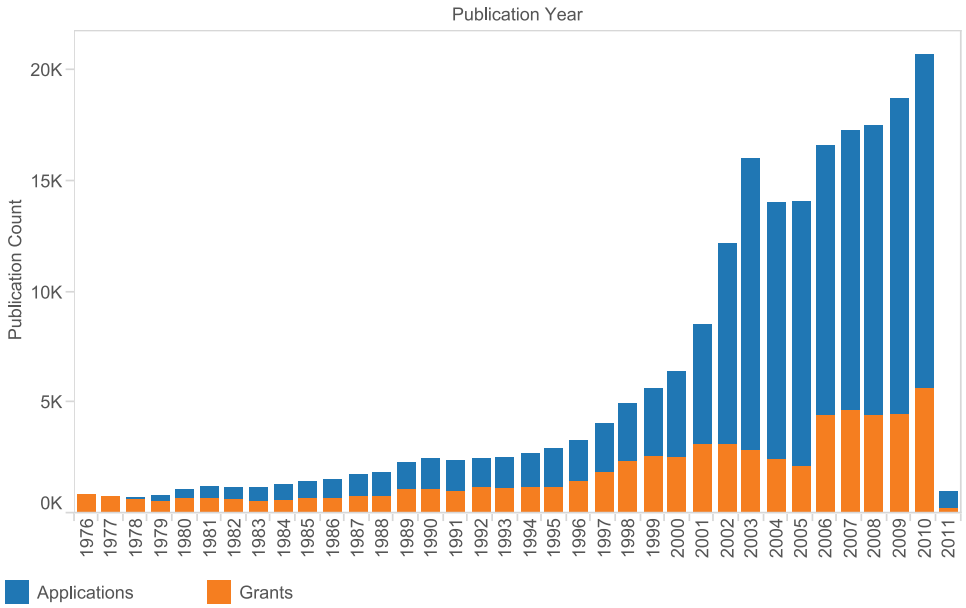
We begin our analysis with an overview of biodiversity that is known to occur in South Africa in the patent system and then turn to data on species originating from South Africa.

South Africa shares a significant proportion of its known biodiversity with other countries in Africa and around the world. Plate 3 provides an overview of patent activity for species that are known to occur in South Africa and other countries around the world. This overview provides information on trends in applications and grants, the top species appearing in patents that are known to occur in South Africa, top applicants or assignees and technology areas.

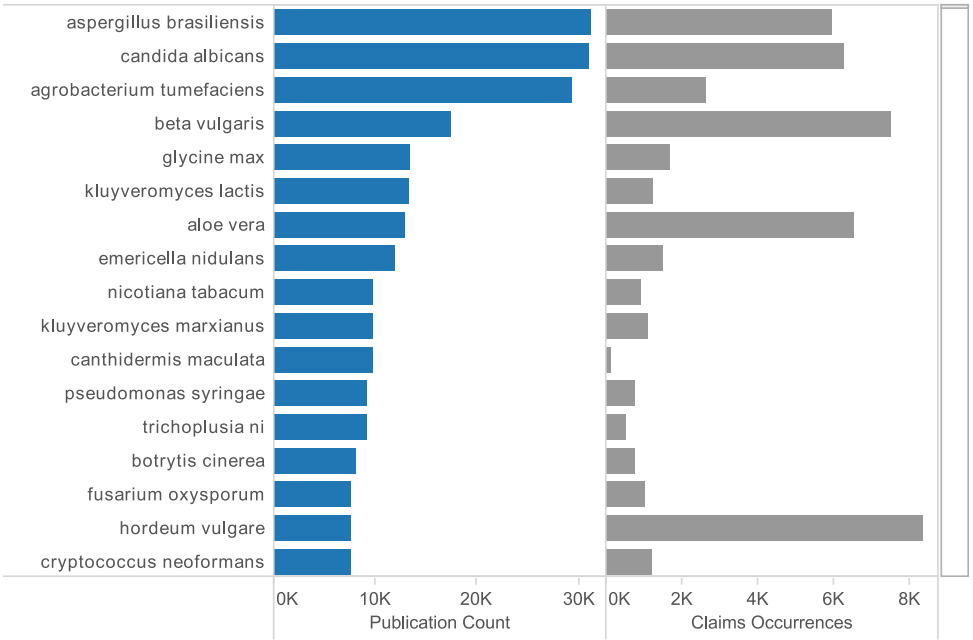
In total we identified approximately 6,415 species names in patent data from the major jurisdictions that are known to occur in South Africa. When model organisms including crops such as *Zea mays* (maize) and *Homo sapiens* are excluded this falls to 6,282 species names of which approximately 4,617 are accepted scientific names.[1] This data is relevant for South Africa because it demonstrates that researchers and companies are conducting research and development on species that are known to occur in South Africa. As Plate 3 makes clear research and development is taking place across a range of technology sectors and is targeted to a variety of markets.

[1] The 6,282 figure excludes common model organisms such as *E. coli*, *Arabidopsis thaliana*, *Bacillus subtilis* and *Zea mays* (maize) that are globally distributed and are used as research tools in biotechnology. These species appear prominently in patent data for all almost countries and are therefore excluded.

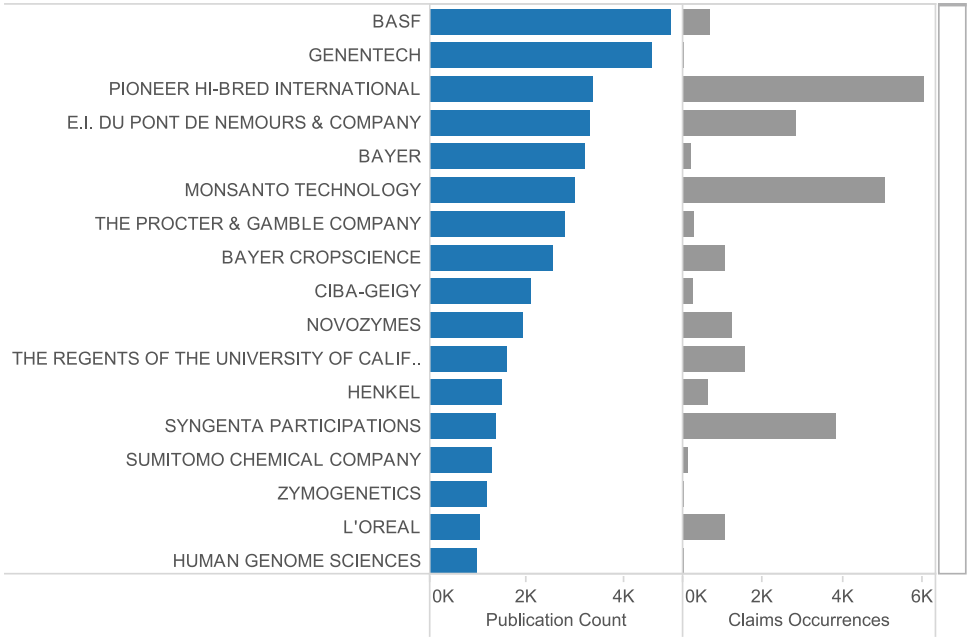
Trends



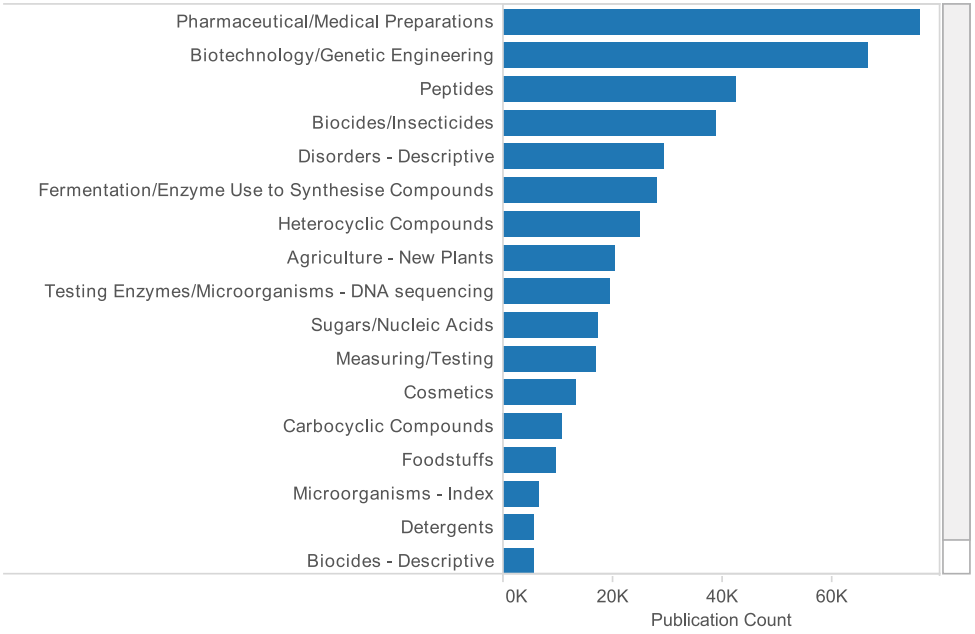
Species



Assignees



Technology Area



The top species of relevance to South Africa in global patent data include species used in biotechnology such as *Aspergillus brasiliensis* (formerly *Aspergillus niger*) and *Emericella nidulans* (*Aspergillus nidulans*). In total we identified 2,656 plant names in global data of relevance to South Africa with crops represented by species and varieties of beet (*Beta vulgaris*), soya (*Glycine max*), barley (*Hordeum vulgare*) and tobacco (*Nicotiana tabacum*). *Aloe vera* (formerly *Aloe barbadensis* or *Aloe petricola*) features; this and other aloes are used extensively for their pharmaceutical and cosmetic potential. Patent data for plants of relevance to South Africa also includes frequent references to hoodia species and the Bushwillow tree (*Combretum caffrum*) (not shown). Other species include several micro-organisms such the plant pathogen *Pseudomonas syringae* and species of Kluyveromyces which are used in genomic studies or for their ability to produce lactase enzymes.

The assignees in the overall data for species of relevance to South Africa range across a spectrum from biotechnology (i.e. Genentech), companies such as BASF and Bayer in areas such as biocides/insecticides, agriculture (i.e. Du Pont) and personal and household products such as Proctor and Gamble. More detailed analysis of technology areas revealed biopharmaceutical companies such as Oxigene Inc. which specialises in anti cancer treatments. The Morinaga Milk Industry Co. is conducting research and development of supplements which improve pancreatic functions and offer other health benefits. As this makes clear there are a wide range of general and specialised technology areas and markets of relevance to biodiversity from South Africa. To gain a more focused view of activity we now turn to the results of research to identify organisms appearing in patents that were directly collected in South Africa or where distribution data suggests that South Africa is the likely source.

Species from South Africa in Patent Data:

In total we identified 110 species of organisms that were directly sourced from, or potentially originate from, South Africa based on distribution data. An additional 44 species were retained as being of relevance to South Africa for a variety of reasons but are excluded from the statistics. Plate 4 displays the top species for South Africa from 37 selected species based on a manual review of patent documents. In the next section a summary is provided for these species. Species of relevance to South Africa for other reasons appear at the end of the summary under “Other Species”. This data will also be made available online to allow for further exploration of each case.

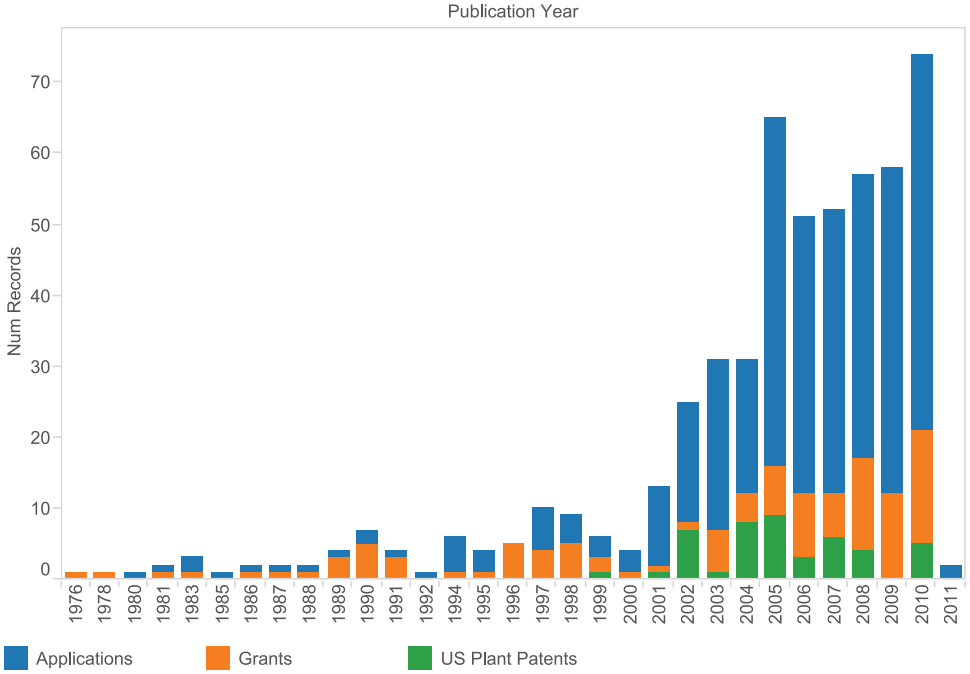
Plate 4 reveals that based on detailed analysis of patent documents, certain species move to the fore in the data compared with the global overview provided in Plate 3. It is notable that endemic plants are particularly prominent in this list. The top species is *Combretum caffrum*, commonly known as the Bushwillow tree. This tree is the source of combretastatin which is taken from the bark and is used to restrict the flow of blood to tumors. Work has been carried out by Arizona State University on improving the solubility of combretastatin A-4 through the development of prodrugs and trans-isomers (e.g.: US701897B1) and the biopharmaceutical company Oxigene in association with Baylor University has continued research and development in the application of these compounds in cancer treatment (e.g.: US20030149003A1). Oxigene has a combretastatin vascular disrupting agent product candidate in development under the name ZYBRESTAT focusing on thyroid cancer. Combretastatin is also now known as Fosbretabulin.

Aloe africana is one of a number of aloe species which feature in the species list. Aloe is a widely used plant for a variety of technologies including for cosmetic and skin care and pharmaceutical purposes. Morinaga Milk Industry Co Ltd has researched into a number of

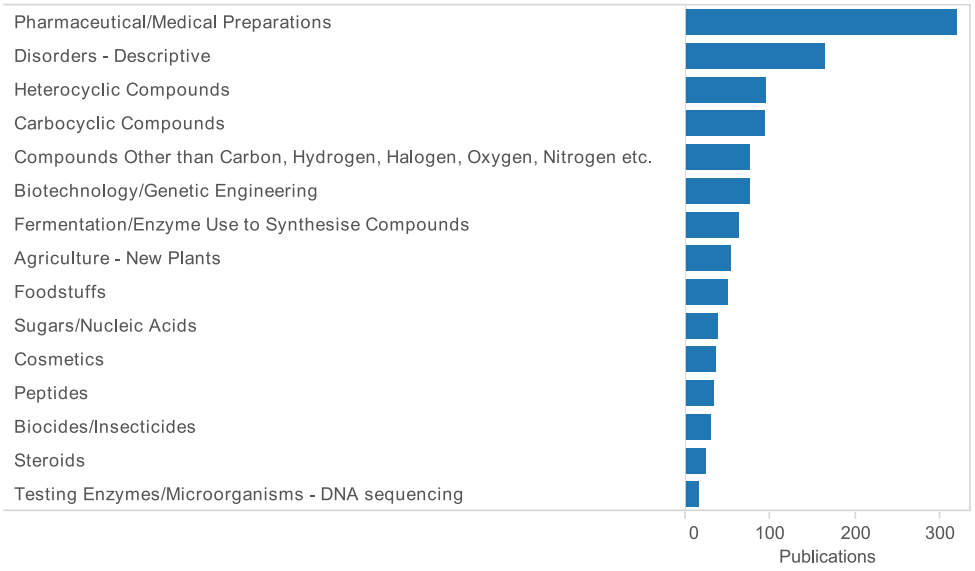
Species

Species	Kingdom	Distribution	Data Type
Combretum caffrum	plantae	Endemic	Distribution
Aloe africana	plantae	Endemic	Origin
Cyclopia species	plantae	Endemic	Distribution
Sclerochiton illcifolius	plantae	Endemic	Origin
Zantedeschia sprengeri	plantae	Cosmopolitan	Distribution
Sceletium tortuosum	plantae	Uncertain	Distribution
Hoodia species	plantae	Endemic	Distribution
Cryptococcus amylolentus	fungi	Uncertain	Distribution
Aspalathus linearis	plantae	Cosmopolitan	Origin
Cryptocarya Latifolia	plantae	Endemic	Distribution
Aloe petricola (Aloe vera)	plantae	Endemic	Origin
Sorangium cellulosum	bacteria	Cosmopolitan	Origin
Sceletium expansum	plantae	Endemic	Distribution
Plectranthus hilliardiae	plantae	Cosmopolitan	Distribution
Zygozyma oligophaga	fungi	Uncertain	Distribution
Ornithogalum multifolium	plantae	Endemic	Distribution
Nudaurelia omega virus	virales	Cosmopolitan	Origin
Hoodia gordonii	plantae	Cosmopolitan	Origin
Harpagophytum procumbens	plantae	Cosmopolitan	Origin
Hansenula philodendra	fungi	Uncertain	Distribution
Callitris arborea	plantae	Uncertain	Distribution
Bacterium xylinum	bacteria	Cosmopolitan	Distribution
Umtiza listerania	plantae	Endemic	Distribution
Spiloxene schlechteri	plantae	Endemic	Distribution
Protea pulchra	plantae	Endemic	Distribution
Hypoxis latifolia	plantae	Uncertain	Distribution
Crocosmia masonorum	plantae	Cosmopolitan	Distribution
Cephalodiscus gilchristi	animalia	Uncertain	Distribution
Siphonochilus natalensis	plantae	Endemic	Distribution
Scabiosa anthemifolia	plantae	Cosmopolitan	Distribution
Priestleya tomentosa	plantae	Endemic	Distribution
Ogataea kodamae	fungi	Uncertain	Distribution
Myxozyma vanderwaltii	fungi	Uncertain	Distribution
Lobostemon trigonus	plantae	Endemic	Distribution
Kluyveromyces delphensis	fungi	Cosmopolitan	Distribution
HIV Subtype C South African..	virales	Cosmopolitan	Origin
Eupenicillium alutaceum	fungi	Uncertain	Distribution

Trends



Technology Areas



uses for active compounds extracted from Aloe africana including for the treatment of diseases resulting from reduced pancreatic functions (US7531520B2) and for the treatment of hyperglycemia and its complications (US7754704B2). Another use of aloe is demonstrated by Proctor and Gamble Co in WO2001062265A1 in which they claim for an orally administered composition for the rehydration of mammalian skin. The species *Aloe vera* (formerly *Aloe petricola*) is a related species which has been very widely used in cosmetic products, Henkel & Co AG KAA uses a preparation made from *A. vera* as a hair dye (WO2006125619A1).

Cyclopia is the genus of leguminous plants better known as 'Honeybush'. This plant and extracts from it have a number of uses. The plant is taken as a traditional infusion, and the use of extracts from it are used as food supplements providing vitamins and minerals (for example US20080014305A1 - Albrecht CFDV). Other cosmetic and personal care uses for extracts include as an additive to a cleaner which can be used in a variety of toiletries (WO2010056232A1- Colgate Palmolive Co) and as an ingredient in a cosmetic towelette (EP1893293B1 - Conopco In DBA Unilever, Hindustan Unilever Ltd et al).

Monatin is an amino acid isolated from the root bark of the plant *Sclerochiton ilicifolius*. It is useful as it is a high intensity sweetener with potential to replace sugars. Cargill Inc (US20050112260A1) have developed tabletop sweeteners and beverages using monatin, as well as researching polypeptides and biosynthetic pathways for the production of stereoisomers of monatin (US20080020434A1). This plant and its byproducts demonstrate a potential for significant economic benefits as healthier alternatives to traditional sweeteners if taken up on a large scale.

Zantedeschia sprengeri is an herbaceous flowering plant in the family Araceae known as the Calla lily This species highlights the commercial importance of horticulture and the development of new varieties and cultivars of South African species. A number of new cultivars have been developed by Sande BV (for example US20070039082P1). Similarly Boeket Handelmaatschappij BV and Callas New Zealand Ltd (e.g.: USPP1564P3) undertake the same type of cultivar development. An aspect of the horticultural industry is that many new varieties may be developed from cultivars long established in another country though the wild variety originates from South Africa.

Species of the genus Hoodia are well known as an appetite suppressant and for its traditional uses by the San people. T & P Lovate Inc and Northern Innovations & Formulations Corp have developed an appetite suppressant as a part of a weight management composition (US20100124578A1). A process for harvesting and preparing Hoodia to make a steroidal glycoside composition for the same purpose has been developed by Conopco Inc DBA Unilever, Hindustan Unilever Ltd & Unilever NL (WO2008022875A1). We would emphasise that this data represents only part of the wider patent landscape for the Hoodia genus.

Only one species of animal is to be found in the most used list. This is *Cephalodiscus gilchristi,* a marine worm found in South African waters. This worm has been found to contain compounds, now named cephalostatins, which are powerful inhibitors of the murine P388 lymphocytic leukemia. Arizona State University and the Department of Health and Human Services of the US Government have undertaken research into the isolation and use of these compounds (US4873245A).

A number of micro-organisms - fungi, bacteria and viruses - appear in the data for SOuth Africa. The yeast *Cryptococcus amylolentus* occurs in a number of patents, often in a long list of species which can be used in processes. Yeast cells are used in methods for obtaining optically active epoxides and vicinal diols The Council for Scientific and Industrial Research in South Africa has been particularly active in this research (for example US20080199912A1). Another example of the use of micro-organisms is found with the bacteria *Sorangium cellulosum*. This species was first isolated from soil on the banks of the Zambezi River in South Africa. This species produces epothilone. This compound has been found to be effective in the treatment of cancers and its synthesis, isolation and purification have been the focus of inventions by Bristol-Myers Squibb Co (W02001064650A2).

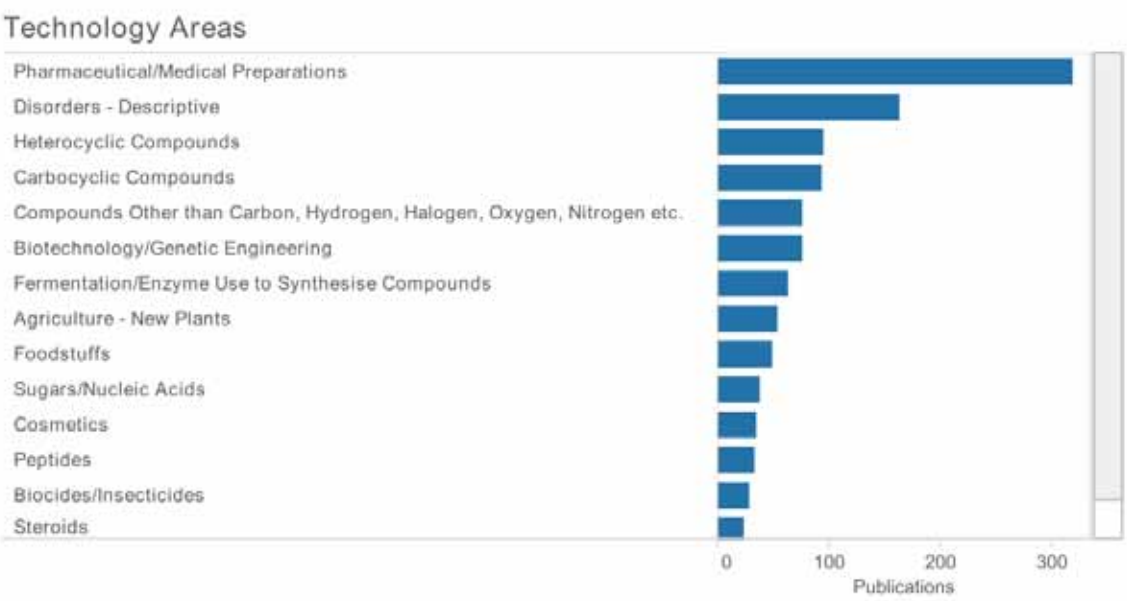
Full details of the species identified in the research are provided in the final section of this report. In considering this data we would note that while species endemic to South Africa merit close attention, cosmopolitan species that are native to several African countries may hold significant potential for collaboration in economic development and conservation.

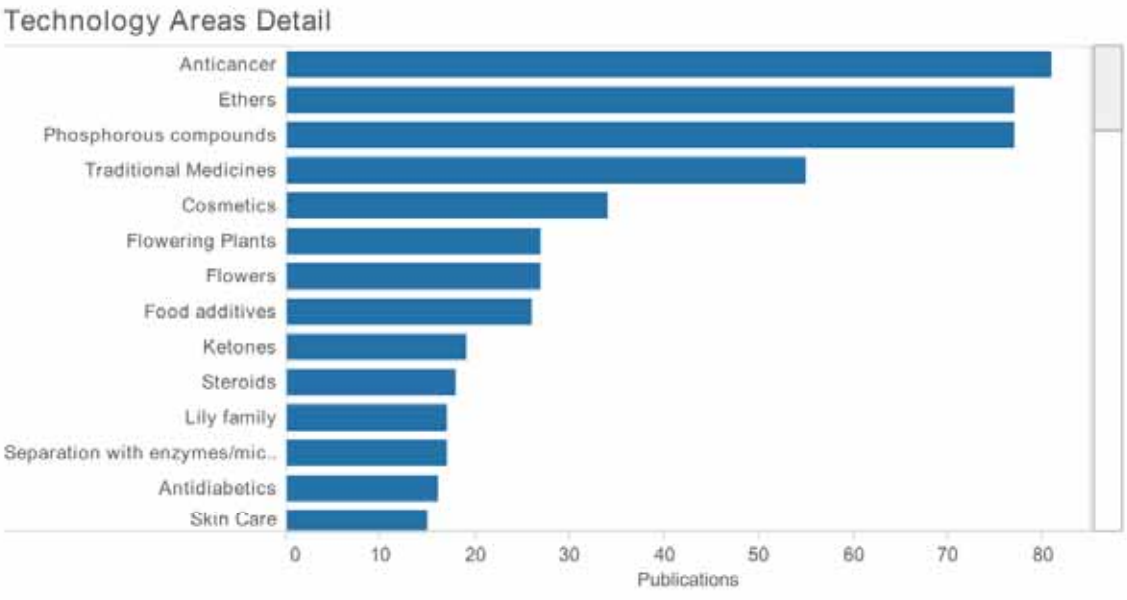
South Africa has a rich portfolio of species that appear in patents. It is important to emphasise that species may be involved in research and development in different areas of science and technology and may serve different markets. In some cases a species may be the target of a particular invention. In other cases a patent may suggest potential uses of a particular organism while in others, the species will be the direct focus of the claimed invention. We now turn to more detailed analysis of the technology areas involving species relevant to South Africa.

Technology Areas:

Table 2 provides a brief summary of the technology areas involved in patent activity for South Africa and is followed by a more detailed break down of activity.

Table 2: Technology Areas





The general overview of technology areas provided in Plate 1 emphasised pharmaceuticals, disorders (descriptive) and heterocyclic and carbocyclic compounds. The narrower dataset that focuses on species from, or likely to originate from, South Africa reveals the same pattern.

Patent activity for pharmaceutical preparations involves species such as the *Combretum caffrum* and *Aloe africana*, which were discussed above. Other species include *Hypoxis latifolia* which has potential as a source of new drugs with immuno-modulatory properties due to the generation of rooperol in the gut when consumed. *Lobostemon trigonus* is cited in a long list of plant species which can be used in a phytoceutical composition for the

prevention and treatment of circulatory disorders. A breakdown of technology areas for a sample of species is provided in Table 3.

Table 3: Species and Technology Areas

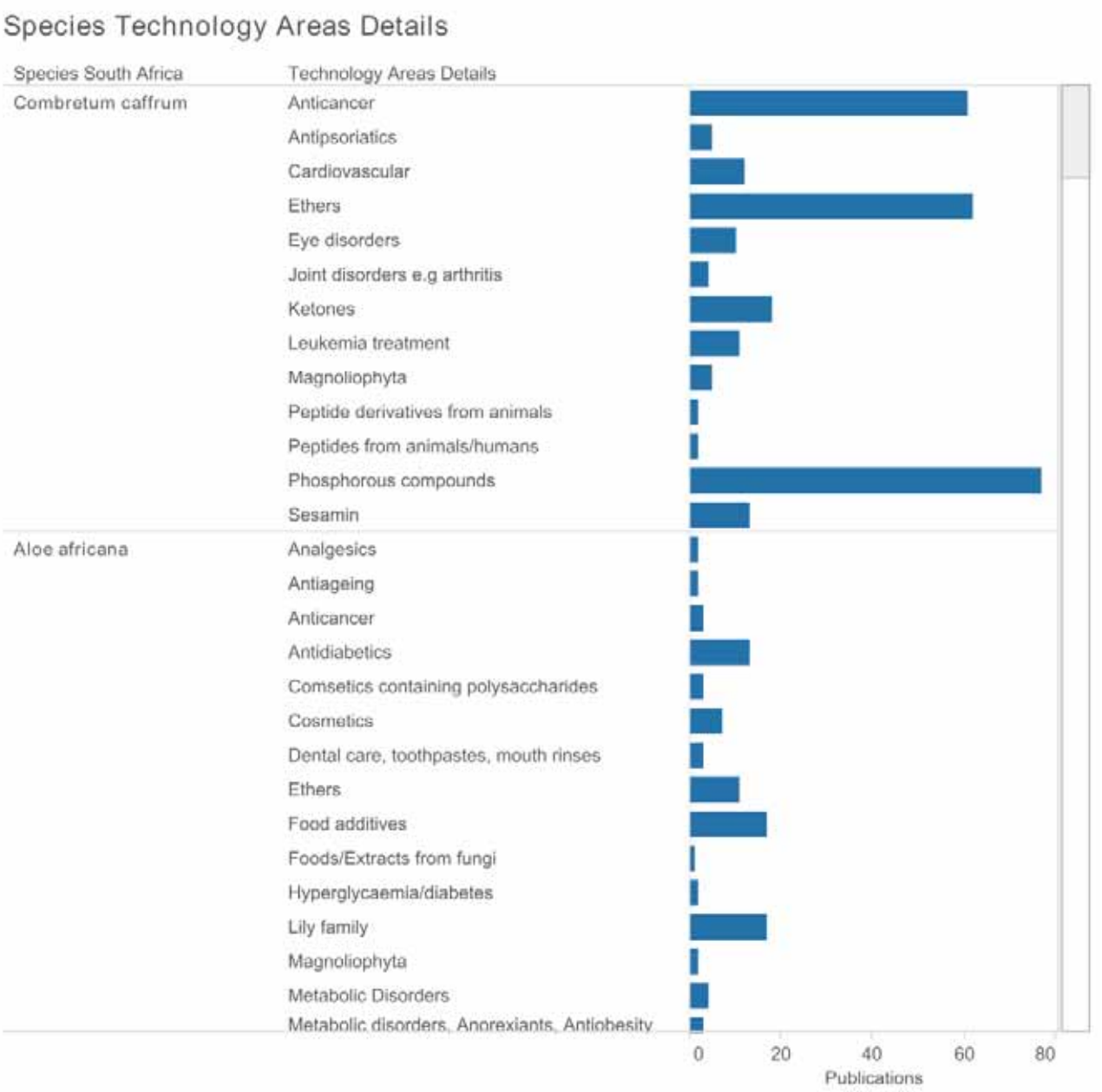


Table 3 usefully reveals the range of potential applications and technology areas where a species and its components may be deployed. As such a species may be a focus of activity for a range of different products and markets. However, in the case of threatened species there will be a need for careful stewardship and conservation of target species.

Patent Claims:

Additional insights can be provided by examining the types of claims that are being made in relation to the species. A patent application may contain multiple claims but is required to contain only one invention. The first claim sets out the major focus of the claimed invention and frames all other claims.

Patents are awarded for three main classes of invention:

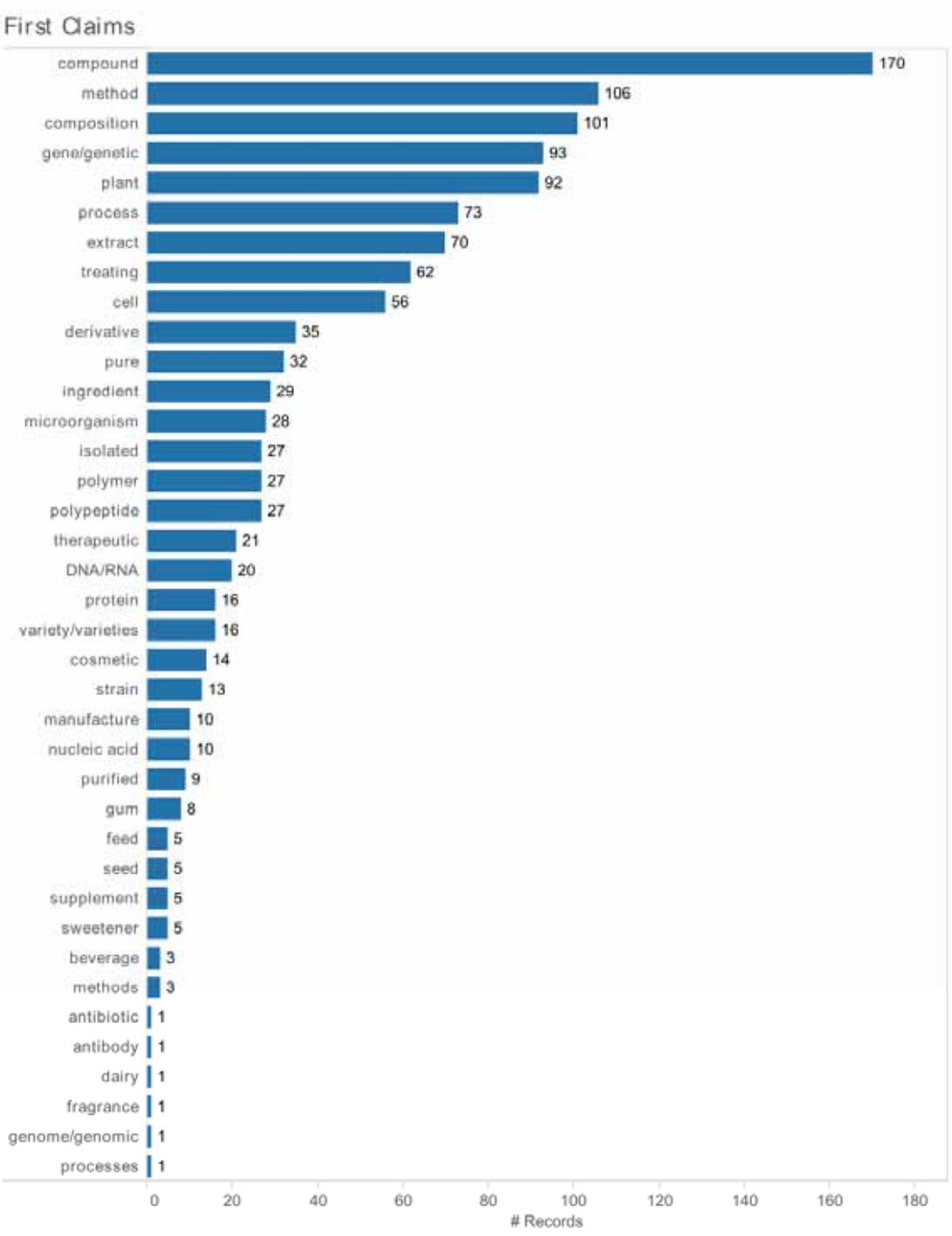
1. Compositions of matter;
2. Methods or processes;
3. Machines;
4. In some jurisdictions claims may be permitted for new plant varieties either under standard patent legislation or under specific legislation (i.e. US Plant Patents).

Table 4 displays a summary of the top terms appearing in patent claims relating to genetic resources for South Africa.

Table 4 reveals that the top category of patent claims reference compounds. These can encompass a variety of claimed inventions. For example, a pharmaceutical composition from components of Aloe plants claims “A method for inhibiting visceral fat accumulation, comprising administering an isolated compound represented by the following formula (1) to a target whose accumulation of visceral fat is to be inhibited” (US7846905B2). In this claim the compound is made from plant extracts, In contrast, the University of Pretoria claims a Phloroglucinol compound as “A phloroglucinol compound of formula 1:00R3’21R0ji512’A’ R wherein, R represents an H, OH, OCH3 or CH2CH3 group or a similar hydrocarbon derivative, or a pharmaceutically acceptable salt, ester or derivative thereof” (WO2001023342A1). In this invention the compound is used to treat tuberculosis caused by pathogenic bacteria and fungi and 28 named plants are screened to test activity against drug-resistant bacteria in the development of the compound. As this makes clear claims to compounds and how species are used within the claims may take a variety of forms.

The second category of patent claims is for methods, such as methods of producing a plant, a compound or other desired outcome. Method claims are frequently more restrictive in their coverage of genetic resources because the genetic component is only claimed in so far that it is relevant to performing the method. That is, it is the method that is the focus of the invention. Therefore it is the method, and the use of the claimed genetic or biological component in performing that method, that is the subject matter of protection.

Table 4: Terms Appearing in the First Claims of Patent Documents



The third major formal category of patent claim is for compositions of matter (compositions). Compositions are commonly extracts, compounds or combinations of ingredients (i.e. in pharmaceuticals or cosmetics and herbal medicines). Patent claims for compositions typically include a list of the compounds or ingredients that are the subject matter for protection. These claims are frequently broadly constructed such that the use of compounds from the species, the genus, and in some cases the family, are incorporated into the scope of the claims. While composition of matter claims may be constructed in various ways, broad claims may well impinge upon the ability of producers from a country

to export products containing the claimed components into markets where a patent is in force.

An example of this type of issue is provided by an application submitted by Coca-Cola Co relating to hoodia species for use in a composition with high potency sweeteners for use as a weight management product. The first claim of this application reads as follows:

“A functional sweetener composition comprising: at least one weight management agent; at least one high-potency sweetener; and at least one sweet taste improving composition.”

Claim 7 goes on to expand this claim by stating:

“The functional sweetener composition of claim 1, wherein the at least one weight management agent comprises at least one herbal extract selected from the group consisting of polyphenols, Garcinia Cambogia, Gymnema Sylvestre, Kola Nut, Citrus Aurantium, Yerba Mate Griffonia Simplicifolia, Guarana, Green Tea, myrrh, guggul Lipid, black current seed oil, green tea leaf, *extracts of the genera Hoodia*, Stapelia, Orbea, Asclepias, Trichocaulon, Camelia, and combinations thereof.” (WO2007061873A1) (emphasis added).

This type of claim, where granted, is likely to prove to be a problem because it refers to the use of an extract of any member of the genus Hoodia to manufacture a weight management product. It illustrates the type of problem that can emerge in broadly constructed composition of matter claims. We would note that patent claims in an original application are typically broadly constructed and may be modified, narrowed or rejected at the examination stage. It is therefore important to follow the progress of applications with particular attention to the modification of patent claims. We discuss broadly constructed claims further below in connection with the problem of essential incorporation of species into patent claims.

Patent activity that involves claims to a process or processes are similar to methods claims. Typically, these claims focus on the process for producing or manufacturing a desired product (such as a chemical, a cosmetic or a beverage). It is the process itself that is the focus of the invention. For example, Conopco Inc DBA Unilever, Hindustan Unilever Ltd and Unilever NL claim “Process for preparing a composition comprising one or more steroidal glycosides, comprising the steps of a) harvesting Hoodia plants, b) drying the cut plants, whereby exposure to UV light during the drying step is avoided, such that the total UV dose is less than about 0.5lJ/m2 to obtain dried plant material” (WO2008022875A1). However, patent claims for processes are typically constructed so that a component or product created using the process is included in the scope of protection. For example, the above application ends with the following claims “8. Process according to any one of the preceding claims, wherein the plants are selected from the group consisting of Hoodia gordonii, Hoodia currorii, Hoodia lugardii and mixtures thereof. 9. Process according to claim 8, wherein the plant is Hoodia gordonii ” The same component or product created using a different process would not logically fall within the scope of this type of patent. Once again it is important also to examine the modification of patent claims as they move toward patent grants.

Finally, one feature of patent activity involving species that originate from, or are distributed in South Africa is the appearance of species names in long lists of species, genera, or families, of organisms rather than evidence of the direct collection of an organism or sample in South Africa. This is characteristic of many patent applications

involving species from African countries but is unlikely to be particular to Africa. The purpose of these references can be described as incorporation of the referenced species, genus or family into the scope of the patent claims. That is, as in the case of *Cryptococcus amylolentus* mentioned above, any use of a specified compound or extract from the organism, genus or family is presented as falling within the scope of the claims. As we have suggested above, incorporation can provide useful clues on the potential properties and uses of organisms. The purpose of incorporation, from a patent lawyers perspective, is likely to be defensive. However, it is important to recognise the uncertainties and restrictions that essential incorporation of species, genera and families of organisms into patent claims may impose on producers from countries of origin in accessing markets.

As this brief discussion of patent claims suggests, it is important to pay close attention to both the type and the content of patent claims. In addition, it is important to establish whether a patent has been granted, the jurisdictions where a patent has been granted, and whether it is in force. This type of analysis is particularly important when considering the potential development of products for markets. However, detailed patent analysis such as freedom to operate, patent validity, patentability, patent infringement and patent landscape analysis requires specialist analysis beyond the scope of the present report.

Given the increasing importance of these issues for economic development the World Intellectual Property Organization has established a Patent Landscaping initiative under its development agenda that commissions specialist patent research at the request of member states. We recommend the WIPO Patent Landscaping initiative for detailed analysis of specific landscapes for species or genetic resources of interest.

Global Impacts and Global Markets:

We have seen above that a range of species are involved in patent activity of relevance to South Africa. However, it is important to note that many patent applications simply go nowhere. They may embody the hopes and ambitions of individuals, researchers, universities and companies but do not ultimately have an impact either in the patent system or in the market. A means for identifying important patents is therefore needed. Here we discuss two measures: a) patent citations, and; b) patent families.

Table 5 displays the citation scores by species and assignee for species relevant to South Africa. When a patent is filed and published it becomes prior art. Later patent applications that make claims for the same invention will find that the scope of what they claim as new, involving an inventive step, and useful will be limited by these earlier claims. This is recorded in the patent system as a citation. The more often that a patent is cited by later patent applications is a measure of the importance and impact of that patent within the patent system. In some cases a single patent application may attract over a thousand citations. Patent citation counts are therefore an important measure of the importance of patent activity because these scores reveal the impact of patent activity on other applicants.

In the case of South Africa, Table 5 reveals a selection of citation scores for species of relevance to South Africa organised by assignee and species. The top cited species receives 255 citations in 19 documents from Cargill Inc involving *Sclerochiton ilicifolius* for “Chewing gum compositions comprising monatin and methods making same” (WO2005016022A1 - 45 citations), also “Beverage compositions Comprising monatin and methods of making same” (WO2005020721A1 - 42 citations) and also “Monatin tabletop sweetener compositions and methods for making

same” (WO2005014839A2 - 31 citations). All three of these top cited patents are for products derived from monatin. Additionally US20080020434A1 (17 citations) concerns “Polypeptides and biosynthetic pathways for the production of stereoisomers of monatin and their precursors”, and this clearly shows the development of methods for synthesizing monatin without the need to collect it from its natural source.

Documents describing work undertaken using *Aloe africana* by Carrington Lab Inc are the next most cited, showing 210 citations of 9 documents. US4917890A (52 citations) concerns “Processes for preparation of aloe products, products produced thereby and compositions thereof’. Specifically this document describes a process which produces substantially anthraquinone-free aloe gel. The high number of citations reveals the potentially important economic importance of high quality extracts from the species, and by inference the high economic importance of the species itself.

Belonogaster petiolata is a species of wasp which has been used by Res Assoc Biotechnology in the development of “Primers for synthesizing full length cDNA and their use” (EP1130094A2). This particular patent has been cited a total of 116 times. In the original patent a B. petiolata sequence is listed in the manufacturing process. The use of the resulting oligonucleotide in subsequent synthesizing of polynucleotides for further research would not, therefore, concern the named species. This example illustrates that on occasions a species of relevance to an initial patent document does not by necessity have relevance to subsequent work citing the original document.

Six documents from Arizona State University featuring *Combretum caffrum* have been cited 106 times. One document, US5569786A, which has been cited a total of 37 times, concerns the “Isolation, structural elucidation and synthesis of novel antineoplastic substances denominated ‘combretastatins’”. Natural combretastatins, as stated above, are derived from the bark of *Combretum caffrum* and they have powerful anticancer properties. They may therefore have significant potential commercial value. The synthesis of combretastatins, like the synthesis of monatin, would provide a means of developing the molecules without resorting to ongoing collection from their natural source.

Table 5: Species and Assignee Citing Patents

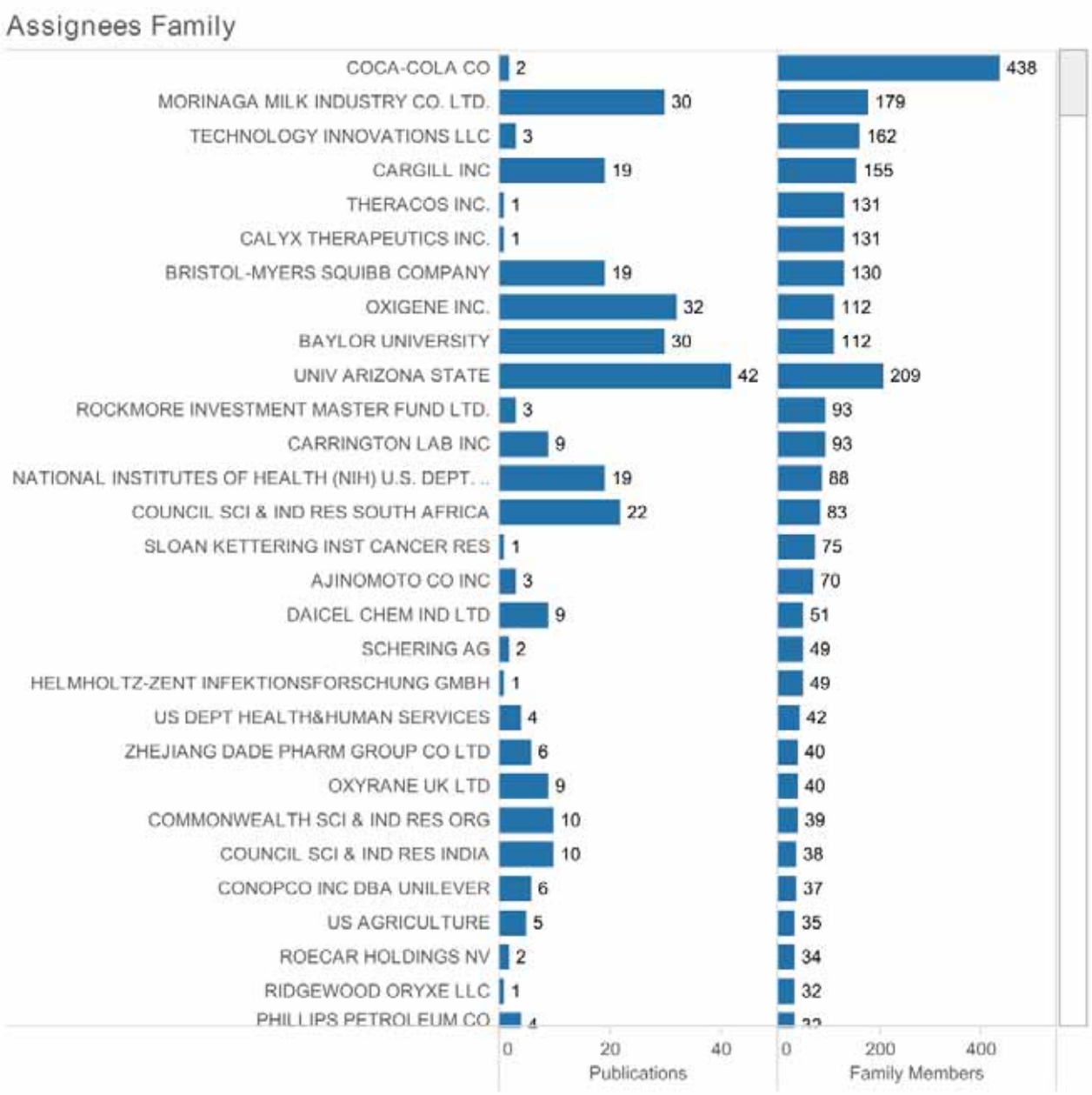
Assignees Citing

Patent Assignees	Species South Africa	Citing Patent Count
CARGILL INC	Sclerochiton ilicifolius	255
CARRINGTON LAB INC	Aloe africana	210
RES ASSOC BIOTECHNOLOGY	Belonogaster petiolata	130
ROCKMORE INVESTMENT MASTER FUND LTD. (COLLATER..	Aloe africana	127
HERIKKUSU KENKYUSHO KK	Belonogaster petiolata	116
HELIX RES INST	Belonogaster petiolata	116
UNIV ARIZONA STATE	Combretum caffrum	106
	Cyclopia species	0
BAYLOR UNIVERSITY	Combretum caffrum	91
ARIZONA BOARD OF REGENTS ACTING FOR AND ON BEHALF OF ARIZONA STATE UNIVERSITY	Cephalodiscus gilchristi	3
	Combretum caffrum	83
OXIGENE INC.	Combretum caffrum	71
ZHAO L	Sclerochiton ilicifolius	70
TECHNOLOGY INNOVATIONS LLC	Combretum caffrum	70
NATIONAL HEALTH RESEARCH INSTITUTES	Combretum caffrum	70
HICKS P	Sclerochiton ilicifolius	70
NATIONAL INSTITUTES OF HEALTH (NIH) U.S. DEPT. OF HEALTH AND HUMAN SERVICES (DHHS) U.S. GOVERNMENT	Cephalodiscus gilchristi	2
	Combretum caffrum	59
	Sceletium tortuosum	6
MCFARLAN S C	Sclerochiton ilicifolius	55
PINNEY K G	Combretum caffrum	50
LINDLEY M G	Sclerochiton ilicifolius	49
GOULSON M J	Sclerochiton ilicifolius	49
CANCER RES VENTURES LTD	Combretum caffrum	47
MCGOWN A T	Combretum caffrum	45
LAWRENCE N J	Combretum caffrum	45
HADFIELD J A	Combretum caffrum	45
EDVARDSEN K	Combretum caffrum	45
CHAPLIN D J	Combretum caffrum	45
WEINER D P	Sclerochiton ilicifolius	43
ROSAZZA J	Sclerochiton ilicifolius	42
PREZIOSO J	Combretum caffrum	42
MILLIS J R	Sclerochiton ilicifolius	42
GARNER C M	Combretum caffrum	42
CAMERON D C	Sclerochiton ilicifolius	42
ABRAHAM T W	Sclerochiton ilicifolius	42
GEVO INC	Myxozyma vanderwaltii	41
HEPWORTH L A	Combretum caffrum	40

A second measure of the importance of patents is provided by the size of patent families. Table 6 ranks assignees based on counts of numbers of patent family members. A patent family is simply a set of patent documents that link back to an original parent filing (known as a “priority” filing). These patent documents can be filed anywhere in the world and can be tracked using unique identifiers known as INPADOC numbers that link back to the parent document. In contrast with patent citations that provide an indicator of the impact of a patent on other applications in the patent system, the size of a patent family reveals how important a patent is to applicants. The reason for this is that they must pay fees each time they file a patent application that is linked to the parent (priority) application.

Patent family data of this type is useful in revealing the applicants who are most vigorously pursuing patent protection involving a species, or as is frequently the case, a group of species around the world. In this case Coca Cola Co claims for a “high potency sweetener for weight management and compositions sweetened therein”(WO2007061873A1 and US20070116840A1). The patent specifically claims for sweetened drinks which include herbal extracts, in this case Hoodia, and as can be seen from Table 6 these documents have a patent family comprising a further 438 documents. These patents have been taken out in countries such as Australia, Argentina, Canada, Europe, Japan as well as South Africa. The large global reach of this family of patents suggests that the company considers the invention to be of significant economic value across many markets. It also illustrates how a wealthy organisation may have a greater capacity to extend its reach on a global scale. The second ranked Morinaga Milk Industry Co is a leading dairy produce and beverage manufacturer in Japan. Their claims exclusively concern the use of the species Aloe africana. A number of different claims are made for food and beverage supplements for health and medical benefits. Examples are EP1808175A1 provides a “drug or food for improving pancreatic function”, US20100286104A1 “an agent for inhibiting visceral fat accumulation” and US20100035851A1 “an agent for improving insulin resistance”. The reach of their patent families which includes 179 documents covers China, Europe, Russia and North America. This example provides an indicator of the potential uses and importance of *Aloe africana* and the commercial significance that Morinaga Milk Industry places on its investment in research.

Table 6: Patent Assignees and Patent Families



Combretum caffrum has been discussed in this report already, but it provides an excellent example of another aspect of patent families. The molecule combretastatin was first identified in the early 1980s, as a result much research has subsequently been undertaken into this chemical with anticancer properties. Technology Innovations Inc, Cargill Inc, Theracos Inc, Calyx Therapeutics Inc, Bristol Myers Sqiubb Company, Oxigene Inc, Baylor University and Arizona State University dominate the table of patent families, each having families of over 100 documents around the world and all focusing on work with combretastatins. This illustration clearly shows that, while many families will focus on a product or method, sometimes it is a single species which can attain global significance and become the focus for many players and this can be identified by examining patent family data.

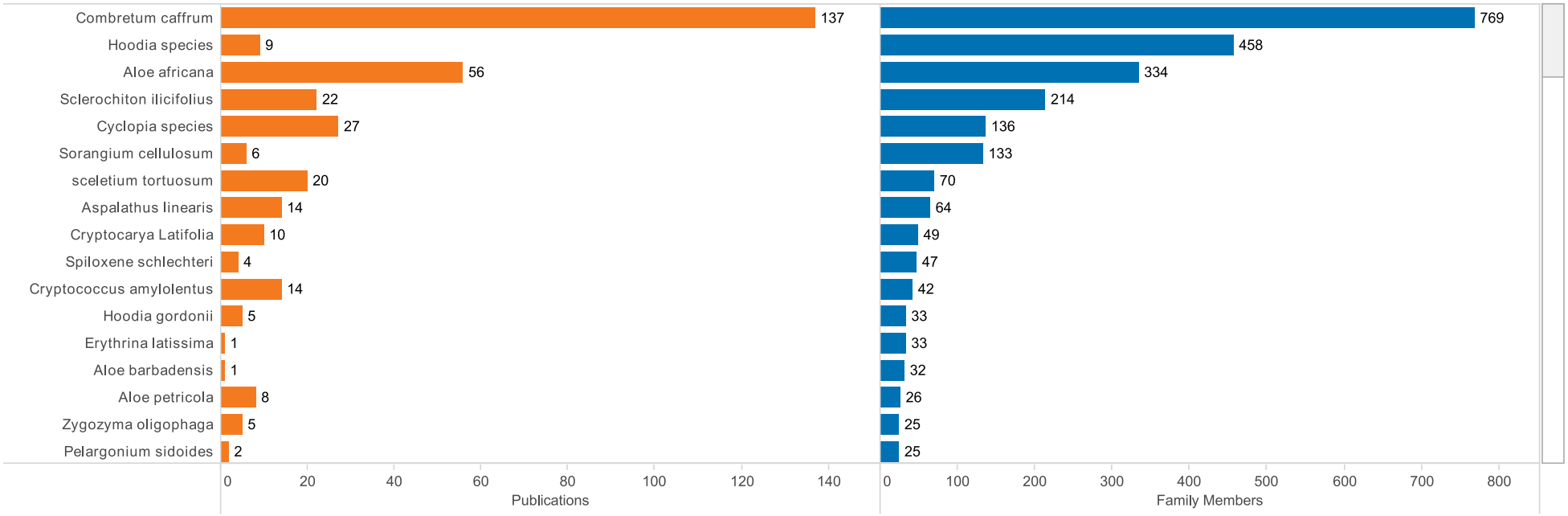
As this makes clear, while care is required in analysing why a particular species is referenced in a patent document, it is possible to trace the economic importance of particular patents to patent applicants using patent family data.

This type of analysis can be extended to the species level to consider the global impacts of patent activity and the position of patents involving a species in global markets.

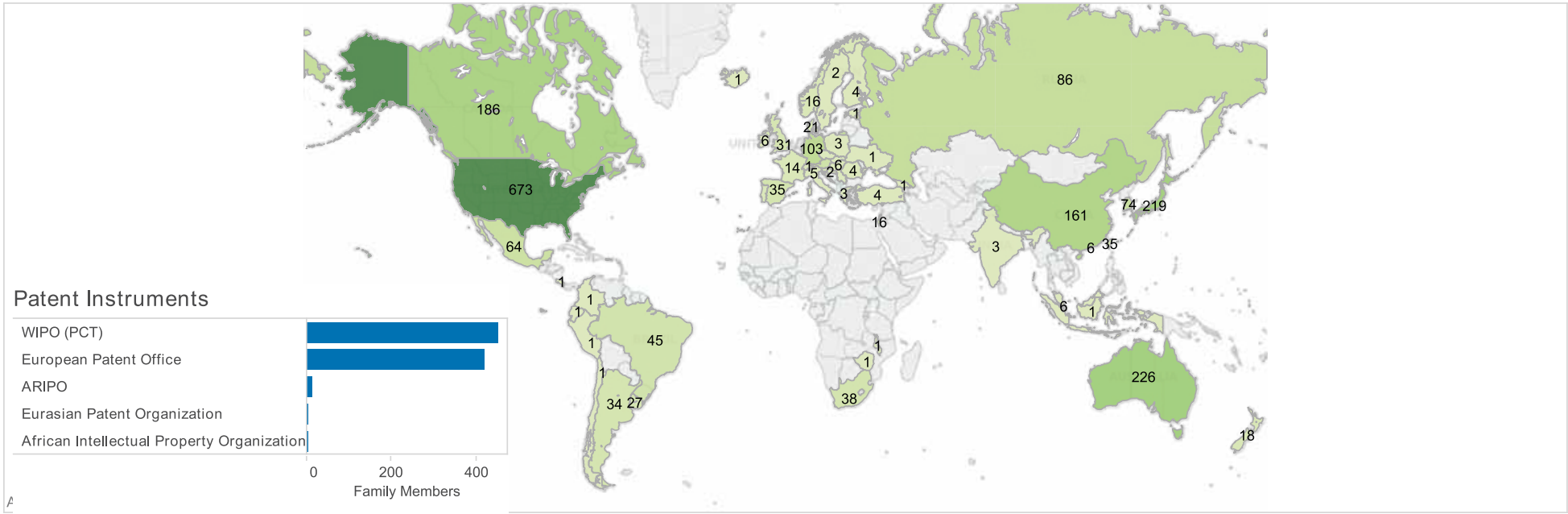
Plate 5 displays patent family data by species and a global map of countries where family members linked to the species have been recorded. Please note that the map does not display the geographical locations for regional and international patent offices. Plate 5 is useful because it reveals what might be called the global reach or careers of species. We can immediately see the prominence of *Combretum caffrum*, Hoodia species and Aloe africana along with *Sclerochitin ilicifolius* in this data.

Analysis of this type is also useful because it exposes the markets where protection is being sought as provided in the Family Countries map. As we might expect the United States is a primary market with Japan and Australia also featuring prominently. However, Germany, China and Canada are also emerging into this landscape. It is notable that available data suggests that patent applicants are only pursuing limited protection in South Africa itself and very little protection at all in the rest of the African continent. This suggests that South Africa may be considered by some as sufficiently economically developed that a strong protection is required, but opportunities may exist within internal markets in other African countries where patent protection is unlikely to prove to be a barrier. At the same time, patent data also suggests countries where markets may exist for products involving biodiversity from South Africa.

Species Family Members



Family Countries



Concluding Remarks:

In the course of preparing this series of country reports South Africa stood out as the most complex. South Africa has the largest number of species records of any country examined so far and the greatest amount of patent activity that makes reference to the country and those species. The particular geography, habitats and biomes found in this part of the continent have resulted in a large number of endemic species and, in the realm of plants in particular, these have proved to be of great interest to inventors from a wide range of commercial and research fields.

In a significant number of cases these documents refer to pharmaceutical and medical uses of plant extracts - from species which have traditional uses such as Hoodia to compounds such as combretastatins. Some species such as those of the Aloe genus have uses across different technological fields such as pharmaceuticals, food supplements, cosmetics and toiletries whereas others have commercial value as a food additive such as the super-sweetener monatin.

The purpose of this report has been to highlight the existing and potential role of species of relevance to South Africa for economic development in support of conservation. We would emphasise that our aim has not been to identify cases of biopiracy or misappropriation. In addition the aim of the research was not to identify the complete portfolio of patent activity for a particular species or genetic resource. We have focused on those patent documents that make direct reference to South Africa or where distribution data suggests that South Africa is a likely source.

The next section presents a series of summary cards for each species identified as particularly relevant during the research. An online interactive version of these cards will be made available through abspat.net to facilitate further research.

Species Summaries

The following summary tables describe the species and patent activity involving the species. This data falls into three categories:

a) Of South African origin - Patents where a named species has been identified as having been obtained from South Africa.
b) With South African distribution - Patents where there is no reference to South Africa but distribution data suggests that the species may have originated from South Africa (Distribution 1).
c) For the sake of completeness we include a final section on ‘Other Species’ that appear in patent documents and are of potential interest. Patents in this group either target the organism (i.e. with a pesticide) or make a reference to the organism in the course of the application.

In reading these tables, note that the number of documents refers to the number of documents retained during research on the origin of species of relevance to South Africa. It does not refer to the wider patent landscape for the species consisting of the total number of documents making reference to the species, or its components, in the global patent system. This point is particularly important in the case of species such as *Hoodia gordonii.*

Species may appear in patent documents in this list for a variety of reasons:

1. Because they are a focus of the invention;
2. Because they are incorporated into the claims of the invention;
3. Because they are a target of the invention (i.e. pathogens or pests)
4. Because a reference to a species, including in very limited cases a literature reference, indicates that the species is of potential interest for economic development and merits further investigation.

Species that fall into the first two categories will be included in the summary section. Species that are in the last two categories will be found in the Other Species section.

This report focuses on identifying species that are of potential interest for economic development and conservation based on their appearance in patent data. The data in this summary section should not be used to draw conclusions about misappropriation or biopiracy.

Of South African origin

Species name: *Acacia mearnsii*	Kingdom: Plantae	
Brief description of species: Originates from Australia. A tree which has become one of the most invasive species across the globe.		
Distribution: Cosmopolitan	No of documents: 1	
WO2009126976A		
Detail: An extract of the bark of Acacia mearnsii (blackwattle) is prepared. The extract may be used as an anti-oxidant in animal feeds and in the raw materials of feeds, as well as in the prevention of the oxidation and depletion of vitamins therein and in vivo.		

Of South African origin

Species name: *Agapanthus orientalis*	Kingdom: Plantae	
Brief description of species: Lily of the Nile. Species boundaries are not clear in the genus, and in spite of having been intensively studied, the number of species recognized by different authorities varies from 6 to 10.		
Distribution: Uncertain	No of documents: 1	
US2010050307P1 (US Plant Patent)		
Detail: New variant 'PMN06' is a distinctive variety of Agapanthus orientalis, which is characterized by its distinctive violet-blue and white bicolored flowers.		

Of South African origin

Species name: *Agathosma betulina*	Kingdom: Plantae	
Brief description of species: Agathosma betulina is a flowering plant in the family Rutaceae, native to the lower elevation mountains of western South Africa, where it occurs near streams in fynbos habitats.		
Distribution: Endemic	No of documents: 1	
WO2006090239A1		
Detail: A treatment pad for soothing skin around the eye. The pad contains extracts of plants including A. betulina		

Of South African origin

Species name: *Aloe africana*	Kingdom: Plantae	
Brief description of species: Known as the African aloe, it is a large species of succulent plant. Restricted to the southeastern part of South Africa, in the Eastern Cape		
Distribution: Endemic	No of documents: 56	
EP0328775A1 EP0619117A2 EP0857485A2 EP0965345A2 EP1731158A1 EP1731527A1 EP1795200A1 EP1808175A1 EP1882472A1 EP1882477A1 EP1927360A1 EP1927361A1 EP1930014A1 EP1930341A1 US2002031481A1 US2003170325A1 US2004115138A1 US2006134238A1 US2007032463A1 US2007141341A1 US2007196435A1 US2008044500A1 US2008125379A1 US2008255077A1 US2009054354A1 US2009069254A1 US2009075913A1 US2009093450A1 US2009131388A1 US2009312275A1 US2010035851A1 US2010240632A1 US2010286104A1 US4598069A US4735935A US4801582A US4917890A US4959214A US4966892A US5650157A US5756141A US6375992B1 US6893648B2 US7329421B2 US7531520B2 US7534770B2 US7674784B2 US7754704B2 US7812012B2 US7846905B2 WO1987000052A1 WO1991016914A1 WO1997034504A1 WO2001062265A1 WO2002085236A2 WO2007075449A2		
Detail: EP0328775A1 provides processes for extracting active chemical substances of aloe. US2009054354A1 provides a food additive to improve pancreatic function using plant extracts from aloe. WO1991016914A1provides a deodorizing preparation for oils and pharmaceuticals.		

Of South African origin

Species name: *Aloe barbadensis*	Kingdom: Plantae	
Brief description of species: Synonym of Aloe vera, a succulent plant species that probably originated in northern Africa. The species does not have any naturally occurring populations.		
Distribution: Cosmopolitan	No of documents: 1	
US2005019384A1		
Detail: Aspects of the invention concern transdermal delivery systems comprised of an ethoxylated lipid. Some formulations are used to deliver pharmaceuticals, therapeutic compounds, and cosmetic agents of various molecular weights.		

Of South African origin

Species name: *Aloe petricola*	Kingdom: Plantae	
Brief description of species: Aloe petricola belongs to the Aloe genus in the Xanthorrhoeaceae family, and is commonly known as a stone aloe. Like other aloes, this species is used medicinally.		
Distribution: Endemic	No of documents: 8	
EP1888021B1 WO2006125619A1 WO2010029005A2 WO2010029007A2 WO2010066723A1 WO2010072576A2 WO2010072577A2 WO2010076122A2		
Detail: EP1888021B1, WO2010029007A2, WO2010072577A2:The inventions relates to hair care products containing agents using aloe extracts for dyeing and/or permanently changing the shape of keratin fibers (hair).		

With South African distribution

Species name: *Aloe vanbalenii*	Kingdom: Plantae	
Brief description of species: Aloe with trailing leaves that only leave the ground once enough stem has formed. Like other aloes, this species is used medicinally.		
Distribution: Cosmopolitan	No of documents: 2	
US5824659A WO1998009635A1		
Detail: US5824659A, WO1998009635A1:The inventions relates generally to protection of the immune system. More particularly, it concerns preventing or correcting immunological damage to skin exposed to ultraviolet irradiation, using aloe extracts.		

With South African distribution

Species name: *Anisodontea elegans*	Kingdom: Plantae	
Brief description of species: Anisodontea is a genus in the tribe Malveae in the family Malvaceae. It comprises twenty-one species native to South Africa.		
Distribution: Endemic	No of documents: 3	
USPP16301P2 USPP18820P2 USPP21393P2 (US Plant Patents)		
Detail: These documents refer to new cultivars of the species grown in South Africa and Australia.		

With South African distribution

Species name: *Arxiozyma telluris*	Kingdom: Fungi	No Image Available
Brief description of species: Thermophillic yeast.		
Distribution: Cosmopolitan	No of documents: 2	
EP0790302A1 US5948665A		
Detail: EP0790302A1, US5948665A: A hexokinase of excellent stability in solution whether in the presence or the absence of glucose, and the present enzyme is a novel substance derived from the cultured of thermophilic yeast.		

With South African distribution

Species name: *Asclepias hastata*	Kingdom: Plantae	
Brief description of species: Synonym for Cynanchum bungei, aka milkweed.		
Distribution: Cosmopolitan	No of documents: 2	
EP1915997A1 US2009104295A1		
Detail: These documents are by the same applicant for a herbal hair growth tonic using processed Cynanchum bungei.		

Of South African origin

Species name: *Aspalathus linearis*	Kingdom: Plantae	
Brief description of species: Rooibos is a broom-like member of the legume family of plants growing in South Africa's fynbos. Used as a bevarage and for cosmetics and medical uses.		
Distribution: Cosmopolitan	No of documents: 14	
WO2010000580A WO2010000579A WO2010000564A WO2008110551A WO2007057310A WO2005041854A US2010222423A1 US2009104298A1 US2009004331A1 US2008247974A1 US2004156798A1 US7094432B2 EP2133088A2 EP1680067B1		
Detail: WO2010000580A: The use of rooibos or rooibos extract in combination with at least one prebiotic for improving skin or hair health. US2009104298A1: The use of an extract of fermented and/or unfermented rooibos leaves and/or stems for reducing or slowing the loss of the natural or artificial colour of hair. US7094432B2: A cosmetic composition comprising Rooibus tea extract in combination with at least one protective agent which is a skin protective agent.		

Of South African origin

Species name: *Aspergillus carneus*	Kingdom: Plantae	No Image Available
Brief description of species: An aerobic mold.		
Distribution: Cosmopolitan	No of documents: 1	
WO2009122362A		
Detail: The invention describes a new Aspergillus carneus fungus strain, designated Aspergillus carneus (van Tiegham) Blockwitz (CBS 116150). The fungus strain produces a number of exogenous fibrolytic enzymes which are capable of increasing cell wall degradation, and thereby digestibility, of an animal feed.		

Of South African origin

Species name: *Bacillus halodurans*	Kingdom: Bacteria	No Image Available
Brief description of species: Alkiphillic bacteria, rod shaped gram-positive and motile, genetically adapted to alkaline environments		
Distribution: Uncertain	No of documents: 1	
US2008003237A1		
Detail: The invention provides flagellin-based fusion proteins (FBFP) useful for a variety of purposes, in bioremediation to remove metal ions from a liquid.		

With South African distribution

Species name: *Bacterium xylinum*	Kingdom: Bacteria	No Image Available
Brief description of species: Some acetic acid bacteria, a notable one being Acetobacter xylinum, are known to synthesize cellulose, something normally done only by plants.		
Distribution: Cosmopolitan	No of documents: 5	
EP1647540A1 EP1647540B1 US2006096588A1 US7674381B2 WO1998043489A1		
Detail: WO1998043489A1: A kombucha based health product. Kombucha is a composition which may contain bacterium xylinum.		

With South African distribution

Species name: *Belonogaster petiolata*	Kingdom: Animalia	
Brief description of species: Wasp species, listed in rDNA encoding list. Wide distribution.		
Distribution: Cosmopolitan	No of documents: 2	
EP1130094A2 EP1396543A2		
Detail: Wasp DNA sequence in long list of homologues for primers for synthesizing rDNA.		

With South African distribution

Species name: *Bifurcaria brassicaeformis*	Kingdom: Plantae	
Brief description of species: Accepted name: Brassicophycus brassicaeformis (WORMS). Extraction of pharma and cosmetic products		
Distribution: Uncertain	No of documents: 2	
WO2006077433A1 US2008260662A1		
Detail: WO2006077433A1 US2008260662A1: A sunscreen product using algae derived compounds. B. brassicaeformis listed as a source of fucoxanthin.		

With South African distribution

Species name: *Blepharis acuminata*	Kingdom: Plantae	
Brief description of species: Metal accumulating plant. Metal recovery from soils.		
Distribution: Cosmopolitan	No of documents: 5	
EP1133576B1 US7268273B2 US2002174451A1 US2008134364A1 WO2000028093A1		
Detail: EP1133576B1:Relates to recovering metals, such as nickel and cobalt, by phytomining or phytoextracting soils rich in metals wherein the desired metal is selectively accumulated in hyperaccumulator plants by adjusting the soil pH.		

With South African distribution

Species name: *Botryoascus synnaedendrus*	Kingdom: Fungi	No Image Available
Brief description of species: Airborne microbial fungus.		
Distribution: Uncertain	No of documents: 12	
EP0197474A2 EP0779366A1 EP0939134A1 EP1288213A1 US5629200A1 US5726047A US5811293A US7094594B2 US2003143701A1 US2005080277A1 US2006246557A1 US4898822A		
Detail: In all patents this is listed in claims for the preparation of various chemicals and derivatives.		

Of South African origin

Species name: *Bulbine frutescens*	Kingdom: Plantae	
Brief description of species: A flowering plant used for treatment of skin problems such as burns. Also used as an infusion. Cultivated ornamental plant.		
Distribution: Cosmopolitan	No of documents: 1	
US2010062085A1		
Detail: A skin treatment for scars and as a cosmetic for aging skin using extracts from this species.		

With South African distribution

Species name: *Bulbine natalensis*	Kingdom: Plantae	
Brief description of species: Bulbine natalensis is a herb found originally in South Africa that has become very popular with bodybuilders looking to gain muscle mass and as a testosterone booster.		
Distribution: Uncertain	No of documents: 1	
US6159494		
Detail: Treatment for healing post operative scar tissue.		

With South African distribution

Species name: *Callitris arborea*	Kingdom: Plantae	
Brief description of species: Synonym for Widdringtonia wallichii, listed as species producing taxol.		
Distribution: Uncertain	No of documents: 5	
EP1364005B1 US2005158860A1 US2005164162A1 WO2002059290A2 WO2003062419A1		
Detail: Patents for evolving cells which produce taxol.		

With South African distribution

Species name: *Candida xylopsoci*	Kingdom: Fungi	No Image Available
Brief description of species: Yeast strain in long list for genetic modification to use in a process.		
Distribution: Uncertain	No of documents: 2	
US2010291653A1 US2010285545A1		
Detail: The biotransformation of Candida to generate oligomers and polymers.		

Of South African origin

Species name: *Carpobrotus edulis*	Kingdom: Plantae	
Brief description of species: Carpobrotus edulis is native to South Africa. It is also known as Hottentot Fig. Naturalised in many places across the globe.		
Distribution: Cosmopolitan	No of documents: 1	
WO2007144723A2		
Detail: The manufacture of an anti-itch cream from C. edulis.		

With South African distribution

Species name: *Cephalodiscus gilchristi*	Kingdom: Animalia	
Brief description of species: Marine worm, extracts from which are used in treatment of leukemia.		
Distribution: Uncertain	No of documents: 4	
WO2010068877A2 US5583224A US5047532A US4873245A		
Detail: Cephalostatin , derived from the marine worms, is used as tumor inhibitor.		

Of South African origin

Species name: *Coleonema album*	Kingdom: Plantae	
Brief description of species: AKA White Confetti Bush. Grown as ornamental plant.		
Distribution: Endemic	No of documents: 1	
WO2005105124A		
Detail:A pharmaceutical composition for use as an immune stimulant, an antibacterial agent, an antifungal agent or an antiviral agent.		

With South African distribution

Species name: *Combretum caffrum*	Kingdom: Plantae	
Brief description of species: Eastern Cape South African Bushwillow tree. Discovered in 1970s. Bark has proved to have anti-cancer properties.		
Distribution: Endemic	No of documents: 138	

EP0276051A2 EP0397336A2 EP1045853B1 EP1263763B1 EP1351911B1 EP1506960A1 EP1559718A1 EP1751128B1 EP2025661A1 EP2042195A1 EP2065358A1 US4940726A US4996237A US5409953A US5569786A US5886025A US5886025A US6593374B2 US6624197B1 US6670344B2 US6773702B2 US6777578B2 US6849656B1 US6855702B2 US6919324B2 US6933316B2 US6943194B1 US7001926B2 US7018987B1 US7037906B1 US7078552B2 US7091240B2 US7105695B2 US7220784B2 US7223747B2 US7279466B2 US7358236B1 US7384925B2 US7429681B2 US7456214B2 US7456289B2 US7507851B2 US7524832B2 US7528165B2 US7547686B2 US7557096B2 US7572778B2 US7659262B2 US7705188B2 US7759527B2 US7786098B2 US7838706B2 US2002055643A1 US2002072507A1 US2002160973A1 US2003149003A1 US2003195244A1 US2003220298A1 US2003220304A1 US2004029838A1 US2004043969A1 US2004044059A1 US2004052761A1 US2004054212A1 US2004067255A1 US2004122083A1 US2004143023A1 US2004152629A1 US2004242696A1 US2005065213A1 US2005065217A1 US2005075516A1 US2005153939A1 US2005176688A1 US2005209310A1 US2005215764A1 US2005240062A1 US2005245489A1 US2005245490A1 US2005249667A1 US2005267108A1 US2005267194A1 US2005272824A1 US2006035868A1 US2006135625A1 US2006142252A1 US2006148801A1 US2006160778A1 US2006165772A1 US2006166942A1 US2006172980A1 US2006194770A1 US2006276440A1 US2006293394A1 US2007073077A1 US2007082872A1 US2007167412A1 US2007185184A1 US2007203217A1 US2007276172A1 US2008045752A1 US2008119649A1 US2008146528A1 US2008214509A1 US2008306027A1 US2009075943A1 US2009170956A1 US2009186857A1 US2009192098A1 US2009258937A1 US2010004403A1 US2010016261A1 US2010129471A1 WO1994005682A1 WO1999034788A1 WO2001019794A2 WO2001068654A2 WO2001081355A1 WO2002022626A1 WO2002049994A2 WO2002050007A2 WO2002056692A1 WO2002102766A2 WO2003024911A1 WO2003035008A2 WO2003040077A1 WO2003059855A1 WO2003086414A1 WO2004009127A1 WO2004052875A1 WO2004099139A1 WO2005007603A2 WO2005113532A1 WO2006074041A2 WO2006138427A2 WO2007035620A2 WO2007086882A2 WO2007110881A1

Detail: US5569786A: Isolation and study of combretastatin, an anteneoplastic substance with potential lymphocytic leukemia inhibiting properties. US4996237A: Combretastatin A-4, found to have significant anti tumor properties.

With South African distribution

Species name: *Crassula argyrophylla*	Kingdom: Plantae	
Brief description of species: Alternative name: Crassula globularioides subsp. argyrophylla. Succulent perennial herb, often forming clumps or mats. Listed in patent for extraction of metals from metal-rich soils. Metal accumulator.		
Distribution: Endemic	No of documents: 1	
EP1133576B1		
Detail: Method for extracting metals from soils using metal accumulating plants.		

With South African distribution

Species name: *Crassula fascicularis*	Kingdom: Plantae	
Brief description of species: Crassula fascicularis is a small branched shrublet that grows several erect stems, topped with clusters of white, cream or light yellow flowers in spring.		
Distribution: Endemic	No of documents: 3	
US2004133941A1 US2003175678A1 WO2002059374A1		
Detail: a method for identifying genes and producing catechin from C.fascicularis.		

With South African distribution

Species name: *Crocosmia fucata*	Kingdom: Plantae	
Brief description of species: Crocosmia is a genus in the Iridaceae family from tropical and eastern South Africa. Plants have erect sword shaped leaves and spikes of tubular or funnel shaped orange to red flowers. Extracts from genus can be used as mammalian a-amylase inhibitors.		
Distribution: Cosmopolitan	No of documents: 1	
WO2009049428A1		
Detail: Cited as a natural source of montbretins for use as an alpha amylase inhibitor.		

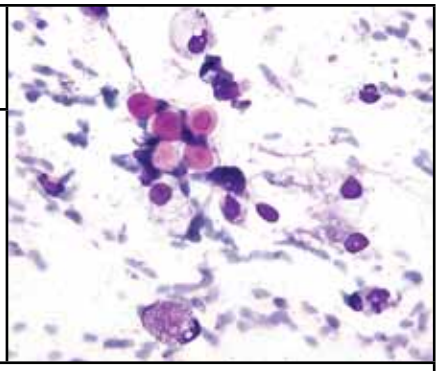
With South African distribution

Species name: *Crocosmia masonorum*	Kingdom: Plantae	
Brief description of species: Crocosmia is a genus in the Iridaceae family from tropical and eastern South Africa. Plants have erect sword shaped leaves and spikes of tubular or funnel shaped orange to red flowers. Extracts from genus can be used as mammalian a-amylase inhibitors.		
Distribution: Cosmopolitan	No of documents: 4	
WO2009049428A1 USPP17165P2 USPP15587P2 USPP14885P2. Note that USPP documents are US Plant Patents.		
Detail: WO2009049428A1: Cited as a natural source of montbretins for use as an alpha amylase inhibitor. USPP17165P2 USPP15587P2 USPP14885P2: Patents for new cultivars outside of South Africa.		

With South African distribution

Species name: *Cryptocarya latifolia*	Kingdom: Plantae	
Brief description of species: Common Name, Broad-Leaved Quince. An evergreen tree with a dense crown. Extracts for control of tuberculosis.		
Distribution: Endemic	No of documents: 3	
US6835755B1 WO2001000554A2 WO2001023342A1		
Detail: Extracts from C. latifolia tested against M. tuburculosis and found to be an inhibitor.		

With South African distribution

Species name: *Cryptococcus amylolentus*	Kingdom: Fungi	
Brief description of species: Cryptococcus is a genus of fungus. These fungi grow in culture as yeasts. The sexual forms or teleomorphs of Cryptococcus species are filamentous fungi in the genus Filobasidiella. Polypeptide encoded by yeast cell gene used in process for obtaining an optically active epoxide.		
Distribution: Uncertain	No of documents: 12	
US2007275448A1 US2007281339A1 US2008171359A1 US2008199912A1 US2008213833A1 US2008286832A1 US2009275077A1 WO2005100578A2 WO2005100587A2 WO2006109198A2 WO2007010403A2 WO2007069079A2		
Detail: US2007275448A1, WO2005100578A2:Yeast strains, and polypeptides encoded by genes of such yeast strains, that have enantiospecific meso-epoxide hydrolase activity. US2008171359A1 WO2007010403A2: Recombinant yeasts for synthesizing epoxide hydrolases		

Of South African origin

Species name: *Cryptosporidium parvum*	Kingdom: Protista	No Image Available
Brief description of species: Cryptosporidium parvum is one of several protozoal species that cause cryptosporidiosis.		
Distribution: Cosmopolitan	No of documents: 1	
WO2001077293A2		
Detail: A method for inhibiting the attachment of C. parvum to a host cell.		

With South African distribution

Species name: *Cyclopia species*	Kingdom: Plantae	
Brief description of species: Cyclopia genistoides, Cyclopia intermedia, Cyclopia sessiliflora, Cyclopia subternata. The honeybush, a plant similar to Rooibos.		
Distribution: Endemic	No of documents: 28	
EP1702675A1 EP1893293B1 EP2253226A1 US7576213B2 US2005255179A1 US2006134265A1 US2006275241A1 US2007031462A1 US2007077308A1 US2008014305A1 US2008102132A2 US2010119463A1 US2011021397A1 WO2003092413A1 WO2004000422A1 WO2005058476A1 WO2006131159A1 WO2008110552A2 WO2009077850A1 WO2010000577A2 WO2009125017A2 WO2010000578A2 WO2010056232A1 WO2010056233A1 WO2010056675A2 WO2010146142A2 WO2008110552A US2005196511A1		
Detail: WO2010000578A; WO2010000577A: For use with prebiotics for skin and hair treatment. WO2008110552A: An anti-diabetic extract of honeybush.		

With South African distribution

Species name: *Delosperma basuticum*	Kingdom: Plantae	
Brief description of species: Delosperma is a genus of around 100 species of succulent plants. Ice plant. patent for new cultivar for horticulture.		
Distribution: Endemic	No of documents: 1	
USPP15793P3 (US Plant Patent)		
Detail: A new cultivar of the species grown in the USA.		

With South African distribution

Species name: *Dodonaea thunbergiana*	Kingdom: Plantae	
Brief description of species: Synonym for Dodonaea viscosa (hop bush) cosmopolitan tropical plant.		
Distribution: Cosmopolitan	No of documents: 1	
WO2005076748A2		
Detail: Patent for anti inflamatory pharmaceutical from plant extract.		

Of South African origin

Species name: *Ecklonia maxima*	Kingdom: Chromista	
Brief description of species: Sea bamboo, is a species of kelp native to the southern oceans. It is most typically found along the southern Atlantic coast of Africa, from the very south of South Africa north to Namibia. It is harvested for both an agricultural supplement and as food for abalone raised on farms.		
Distribution: Cosmopolitan	No of documents: 1	
US3971848A		
Detail: A composition having lubricating property, which is produced from the phaeophyceae such as sea tangle and ecklonia.		

With South African distribution

Species name: *Ehrharta microlaena*	Kingdom: Plantae	
Brief description of species: Ehrharta is a genus of about 25 to 35 species of grass mostly native to Africa, with a few species native to the Mascarene Islands and Indonesia. An isolated nucleic acid molecule which encodes a polypeptide. Various agricultural uses.		
Distribution: Uncertain	No of documents: 1	
WO1998007836A1		
Detail:Purified leucoanthocyanidin reductase polypeptides and methods for obtaining same. Nucleic acid molecule from E. microlaena in process.		

Of South African origin

Species name: *Elephantorrhiza elephantina*	Kingdom: Plantae	
Brief description of species: Low growing suffrutex, arising from a massive underground tuberous root.		
Distribution: Cosmopolitan	No of documents: 2	
US2010316748A1 WO2009053857A2		
Detail: Extract of E.elephantina used to treat BPH.		

With South African distribution

Species name: *Enterococcus phoeniculicola*	Kingdom: Bacteria	No Image Available
Brief description of species: Novel bacteria identified in 2003. Patents concerning identification of named bacteria and additionally research into pharmaceuticals.		
Distribution: Uncertain	No of documents: 1	
WO2005103294A1		
Detail: WO2005103294A1 A microarray for detecting lactic acid bacteria which includes DNA from named species.		

Of South African origin

Species name: *Eriocephalus africanus*	Kingdom: Plantae	
Brief description of species: Eriocephalus africanus is a bushy shrublet indigenous to South Africa. It has a wide distribution in the Western and Eastern Cape, and in Namaqualand.		
Distribution: Endemic	No of documents: 1	
WO2006090239A1		
Detail: A treatment pad for soothing skin around the eye. The pad contains extracts of plants including A. betulina.		

Of South African origin

Species name: *Eriocephalus punctatus*	Kingdom: Plantae	
Brief description of species: Eriocephalus africanus is a bushy shrublet also known as Cape Chamomile, it has traditional medical applications. Indigenous to South Africa.		
Distribution: Endemic	No of documents: 1	
WO2006090239A1		
Detail: A treatment pad for soothing skin around the eye. The pad contains extracts of plants including A. betulina.		

Of South African origin

Species name: *Erythrina latissima*	Kingdom: Plantae	
Brief description of species: A deciduous tree from southern Africa growing 5 to 8 m tall. It is a member of the Fabaceae and occurs naturally in the Afrotemperate mist-belt.		
Distribution: Cosmopolitan	No of documents: 1	
WO1990009438A1		
Detail: Trypsin Inhibitor DE-3 from the Seeds of Erythrina latissima for a thrombolytic, isolation and pharmaceutical usage.		

With South African distribution

Species name: *Euclea natalensis*	Kingdom: Plantae	
Brief description of species: The Euclea natalensis, or Natal Guarri is a small to medium shrub/tree. It occurs predominantly within riverine forest however it can be found in a variety of habitats.		
Distribution: Cosmopolitan	No of documents: 1	
WO2001023342A1 US6835755B1 WO2001000554A2		
Detail: Extracts used medicinally. Research into tuberculosis treatments.		

With South African distribution

Species name: *Eucomis vandermerwei*	Kingdom: Plantae	
Brief description of species: Eucomis vandermerwei is a South African plant and a member of the Asparagus family. Grown horticulturally around the world. Patent for new cultivars.		
Distribution: Endemic	No of documents: 2	
USPP17749P3 US2007050872P1 (US Plant Patents)		
Detail: New cultivar of pineapple lily from E. vandermerwei.		

With South African distribution

Species name: *Eupenicillium alutaceum*	Kingdom: Fungi	No Image Available
Brief description of species: Penicillium is a genus of ascomycetous fungi of major importance in the natural environment as well as food and drug production.		
Distribution: Uncertain	No of documents: 3	
EP0682116A1 US5036004A US5612208A		
Detail: US5612208A: A source of L-serine. EP0682116A1, US5036004A: A source of L-ascorbiate oxidase and gene encoding.		

With South African distribution

Species name: *Gazania rigens leucolaena*	Kingdom: Plantae	
Brief description of species: Gazania rigens is a clumping or spreading plant grown for colorful yellow flowers contrasting with the silver folige.		
Distribution: Uncertain	No of documents: 1	
USPP68250A		
Detail: Patent for a new cultivar of G. rigens.		

With South African distribution

Species name: *Gelidium foliaceum*	Kingdom: Plantae	
Brief description of species: A species of marine algae.		
Distribution: Uncertain	No of documents: 1	
US2008226740A1		
Detail:Marine algal extracts comprising marine algal polysaccharides of low degree polymerizaton, and the preparation processes and uses thereof.		

With South African distribution

Species name: *Gerbera lagascae*	Kingdom: Plantae	
Brief description of species: Synonym for Gerbera linnaei.. Gerbera is very popular and widely used as a decorative garden plant or as cut flowers. The domesticated cultivars are mostly a result of a cross between Gerbera jamesonii and another South African species Gerbera viridifolia.		
Distribution: Uncertain	No of documents: 2	
EP2011388A1 US2009083875A1		
Detail: No clarity of which species is used in the actual invention.		

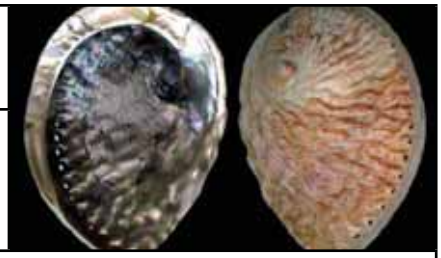
With South African distribution

Species name: *Gleditsia africana*	Kingdom: Plantae	
Brief description of species: Synonym for Erythrophleum africanum, the African blackwood, it is a legume species in the genus Erythrophleum found in Savannahs of tropical Africa. It produces a gum similar to gum arabic. Used in cosmetics and dermatology.		
Distribution: Cosmopolitan	No of documents: 2	
EP2046356B1 WO2008009813A2		
Detail: The invention relates to a novel use of an extract of Gleditsia and/or of triacanthine for the preparation of a cosmetic and/or dermatological composition		

Of South African origin

Species name: *Haliclona tulearensis*	Kingdom: Animalia	
Brief description of species: Haliclona sp., common names Blue sponges or blue finger sponges, is a species of sponge found throughout the Indian ocean and is a source of unique alkaloids.		
Distribution: Cosmopolitan	No of documents: 2	
WO2000020411A US6635656B1		
Detail:A new N-containing metabolite named halitulin with cytotoxic activity, which in turn has led us to a new class of active compounds.		

Of South African origin

Species name: *Haliotis midae*	Kingdom: Animalia	
Brief description of species: South African abalone, one of several sea snails endemic to South Africa.		
Distribution: Endemic	No of documents: 1	
WO2009109359A		
Detail: Relates to a protein or glycoprotein extractable from Haliotis midae and its use as an agent able to prevent the symptoms of allergic disorders.		

With South African distribution

Species name: *Hansenula lynferdii*	Kingdom: Fungi	No Image Available
Brief description of species: A yeast referred to as means of de-sulphurising oil and coal.		
Distribution: Uncertain	No of documents: 1	
US4851350A		
Detail: A means of desulphurising coal and oil in an aqueous state.		

With South African distribution

Species name: *Hansenula philodendra*	Kingdom: Fungi	No Image Available
Brief description of species: A microbial yeast.		
Distribution: Uncertain	No of documents: 7	
EP0017853A2 EP0041650A2 EP0071990A2 US4414334A US7462731B2 US2005272940A1 US4261420A		
Detail: A yeast used in a method of producing a single cell protein material. Also treating an aqueous liquid containing dissolved oxygen to substantially eliminate said dissolved oxygen.		

Of South African origin

Species name: *Harpagophytum procumbens*	Kingdom: Plantae	
Brief description of species: Devil's Claw. Has many medical uses particularly anti-inflammatory and analgesic uses.		
Distribution: Cosmopolitan	No of documents: 3	
US2010261663A1 US2008279931A1 US2008138406A1		
Detail: US2010261663A1: Anti-inflammatory composition. US2008279931A1, US2008138406A1 relief composition.		

Of South African origin

Species name: *Helichrysum caespititium*	Kingdom: Plantae	
Brief description of species: Extracts used medicinally. Research into tuberculosis treatments.		
Distribution: Cosmopolitan	No of documents: 1	
WO2001023342A		
Detail: Isolation of caespitate from H. caespititium and other species in this genus, for use in tuberculosis treatment.		

Of South African origin

Species name: *Hemachatus haemachatus*	Kingdom: Animalae	
Brief description of species: Venomous snake aka rinkhals, similar to cobras.		
Distribution: Endemic	No of documents: 1	
US2009180995A1		
Detail: Venom being used to develop an anti-coagulant.		

Of South African origin

Species name: *HIV Subtype C South African strain*	Kingdom: Virales	No Image Available
Brief description of species: Subtype C is the dominant form in Southern Africa, India, and Nepal.		
Distribution: Cosmopolitan	No of documents: 3	
US2007166784A1 EP2266602A2 WO2006050394A2		

With South African distribution

Species name: *Hoodia species*	Kingdom: Plantae	
Brief description of species: Hoodia flava and Hoodia dregei are succulents native to the Cape Province in South Africa. They are stem succulents traditionally used by the san people of the Namib desert as an appetite suppressant. Note that this data does not refer to the complete patent portfolio for this species.		
Distribution: Endemic	No of documents: 9	
US2007116840A1 US2008261309A1 US2008261310A1 US2010124578A1 WO2007061873A1 WO2008128842A1 WO2008128847A1 WO2010054469A1 WO2010054469A9		

Of South African origin

Species name: *Hoodia currorii*	Kingdom: Plantae	
Brief description of species: Hoodias are succulents native to southern Africa. They are stem succulents traditionally used by the san people of the Namib desert as an appetite suppressant.		
Distribution: Cosmopolitan	No of documents: 1	
WO2006051334A1		
Detail: Use of Hoodia as an appetite suppressant.		

Of South African origin

Species name: *Hoodia gordonii*	Kingdom: Plantae	
Brief description of species: Hoodias are succulents native to southern Africa. They are stem succulents traditionally used by the san people of the Namib desert as an appetite suppressant. Note that patent numbers do not refer to the complete portfolio of patents referencing Hoodia gordonii but those referencing South Africa only.		
Distribution: Cosmopolitan	No of documents: 5	
US2009186103A1 US2010009063A1; US2006159773A1; US2006105068A1		
Detail: US2009186103A1: Process for extracting dry plant material. US2010009063A1: List in claim of active substances. US2006159773A1: Herbal health composition. US2006105068A1: Dietary supplement.		

Of South African origin

Species name: *Hoodia species*	Kingdom: Plantae	
Brief description of species: Hoodias are succulents native to southern Africa. They are stem succulents traditionally used by the San people of the Namib desert and promoted as an appetite suppressant.		
Distribution: Uncertain	No of documents: 5	
US2010247581A1 US2010098783A1 WO2009071425A1 WO2008022875A1 WO2006079056A1		

With South African distribution

Species name: *Hypoxis latifolia*	Kingdom: Plantae	
Brief description of species: Hypoxis is a genus of plant belonging to the Hypoxidaceae family. The seeds are needed to identify many species. Extract used for treatment of cancer and viral infections.		
Distribution: Uncertain	No of documents: 4	
EP0092226A2 EP0130829A2 EP0587396A1 US5609874A		
Detail: Source of hypoxoside in treatments for cancer and viral infection.		

With South African distribution

Species name: *Hypoxis rooperii*	Kingdom: Plantae	
Brief description of species: Hypoxis is a genus of plant belonging to the Hypoxidaceae family.		
Distribution: Uncertain	No of documents: 2	
US5569649A WO1995034296A1		
Detail: Source of hypoxoside for use in anti inflammatory treatments.		

Of South African origin

Species name: *Jaspis digonoxea*	Kingdom: Animalia	No Image Available
Brief description of species: A marine sponge.		
Distribution: Cosmopolitan	No of documents: 1	
EP0687673A1		
Detail: Extraction from sponge, used as an anti tumor treatment.		

Of South African origin

Species name: *JSRV retrovirus*	Kingdom: Virales	No Image Available
Brief description of species: Jaagsiekte sheep retrovirus (JSRV) is a betaretrovirus which is the causative agent of a contagious lung cancer in sheep called Jaagsiekte.		
Distribution: Cosmopolitan	No of documents: 1	
WO2001004266A1		
Detail: Use of JSVR in gene therapy.		

With South African distribution

Species name: *Kluyveromyces delphensis*	Kingdom: Fungi	No Image Available
Brief description of species: Kluyveromyces is a genus of ascomycetous yeasts in the family Saccharomycetaceae.		
Distribution: Cosmopolitan	No of documents: 3	
US6770470B2 US2003008377A1 WO2002008385A1		
Detail: Use in treatment of waste water to remove TMAH.		

Of South African origin

Species name: *Lippia javanica*	Kingdom: Plantae	
Brief description of species: Lippia is a type of verbena which grows on open velt and on forest margins		
Distribution: Cosmopolitan	No of documents: 2	
US2008193387A1 WO2006090239A1		
Detail: Use in an insecticide containing 30% Lippia oil.		

With South African distribution

Species name: *Lithops salicola*	Kingdom: Plantae	
Brief description of species: Lithops salicola is a species of plant in the Aizoaceae family. Patent for methods of mixing large numbers of heterologous genes.		
Distribution: Cosmopolitan	No of documents: 2	
US2006252156A1 WO2004016791A1		
Detail: Used in a process for mixing genetic material.		

With South African distribution

Species name: *Lobostemon trigonus*	Kingdom: Plantae	
Brief description of species: Patent is for a phytoceutical formulation used to treat HIV/ AIDS and/or immune related diseases using extracts from this South African plant. Endemic to Eastern and Western Capes.		
Distribution: Endemic	No of documents: 3	
US2007104728A1 US2008089946A1 WO2007059441A2		
Detail: Used as an ingredient for phytoceutical compositions.		

Of South African origin

Species name: *Monsonia angustifolia*	Kingdom: Plantae	
Brief description of species: A widespread annual herb which grows in woodland and grassland.		
Distribution: Cosmopolitan	No of documents: 2	
WO2007138531A US2009202662A		
Detail: Used in a composition for the treatment of erectile dysfunction and libido.		

With South African distribution

Species name: *Myxozyma vanderwaltii*	Kingdom: Fungi	No Image Available
Brief description of species: A non-fermenting yeast microorganism.		
Distribution: Uncertain	No of documents: 3	
US2009226991A1 WO2009086423A2 WO2010075504A2		
Detail: A method for producing isobutanol using a variety of yeast species during the process. M vanderwaltii listed in claims as usable species.		

With South African distribution

Species name: *Naja flava*	Kingdom: Animalia	
Brief description of species: The Cape cobra is a moderate-sized, highly venomous cobra inhabiting a wide variety of biomes across Southern Africaincluding arid savanna, fynbos, bushveld, desert and semi-desert regions.		
Distribution: Endemic	No of documents: 1	
US4126676A		
Detail: A modified Naja derived neurotoxin for use as treatment for neurological disease.		

Of South African origin

Species name: *Neosartorya fischeri*	Kingdom: Fungi	No Image Available
Brief description of species: A microbial fungus.		
Distribution: Cosmopolitan	No of documents: 1	
WO2009031101A2		
Detail: Used in a process for the improvement of otherwise waste coal.		

Of South African origin

Species name: *Nidorella anomala*	Kingdom: Plantae	
Brief description of species: Small flowering plant, member of the Asteraceae family.		
Distribution: Endemic	No of documents: 1	
WO2001023342A		
Detail: Use of medicinal plants for the treatment of tuberculosis.		

Of South African origin

Species name: *Nudaurelia omega virus*	Kingdom: Virales	No Image Available
Brief description of species: Small insect virus affecting moth species Nudaurelia capensis		
Distribution: Cosmopolitan	No of documents: 5	
US2006127364A1 US2005268353A1 US2005172357A9 US2003041349A1 WO1994004660A1		
Detail: The use of viruses as a means of protecting plants against infestation of this moth species.		

With South African distribution

Species name: *Ogataea kodamae*	Kingdom: Fungi	No Image Available
Brief description of species: A yeast-based expression system for the production of desired polypeptides.		
Distribution: Uncertain	No of documents: 3	
US6645739B2 US2003092099A1 WO2003010288A2		
Detail: A yeast used as a host cell for production of polypeptides and compositions relating to them.		

With South African distribution

Species name: *Ornithogalum multifolium*	Kingdom: Plantae	
Brief description of species: A plant usually less than 10 cm. high, found in shallow pockets of soil on rock outcrops in western Cape. New cultivar (developed in US).		
Distribution: Endemic	No of documents: 5	
US2002100090P1 US2002100092P1 USPP13154P3 USPP13298P3 USPP13314P3 (US Plant Patents)		
Detail: New horticultural cultivar of species developed in the USA.		

Of South African origin

Species name: *Parabuthus tranvaalicus*	Kingdom: Animalia	
Brief description of species: Very venomous scorpion. Range is across dry areas of southern Africa.		
Distribution: Cosmopolitan	No of documents: 2	
WO2003028666A US2003113892A1		
Detail: venom used to develop antivenom through the isolation of polypeptides.		

With South African distribution

Species name: *Pelargonium graveolens*	Kingdom: Plantae	
Brief description of species: The true Pelargonium graveolens is an uncommon species in the Pelargonium genus, which is native to South Africa, Zimbabwe and Mozambique, while the plants cultivated under this name differ from the wild specimens and are of hybrid origin.		
Distribution: Cosmopolitan	No of documents: 1	
WO2006090239A1		
Detail: A treatment pad for soothing skin around the eye. The pad contains extracts of plants including A. betulina.		

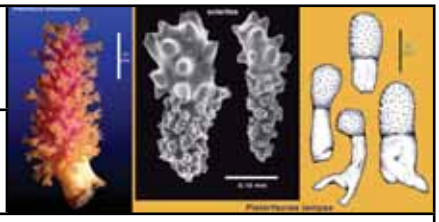
Of South African origin

Species name: *Pelargonium reniforme*	Kingdom: Plantae	
Brief description of species: Pelargonium reniforme is a medicinal plant known to Khoi/ San and Xhosa traditional healers for its properties in curing stomach ailments, bronchitis and dysentery.		
Distribution: Uncertain	No of documents: 2	
US7611734B2; WO2009011498A1		
Detail: US7611734B2: Use of extract from pelargonium to treat disease related behavioral changes and pathological conditions. WO2009011498A1: A composition for the treatment of acute or chronic infection in respiratory system.		

Of South African origin

Species name: *Pelargonium sidoides*	Kingdom: Plantae	
Brief description of species: Common names include Umckaloabo and South African Geranium. Root extract of Pelargonium sidoides is used as cold and flu medicine.		
Distribution: Endemic	No of documents: 2	
US7611734B2 WO2009011498A1		
Detail: US7611734B2: Extracts from Pelargonium species or plant parts thereof, particularly from P. sidoides and P. reniforme for the prophylaxis or treatment of disease-related behavioural changes, WO2009011498A1: Pelargonium sidoides syrup used as a therapeutic agent for acute or chronic infections.		

With South African distribution

Species name: *Pieterfaurea unilobata*	Kingdom: Animalia	
Brief description of species: A marine coral.		
Distribution: Endemic	No of documents: 2	
US2009075964A1 WO2009039103A2		
Detail: A fragrant mood enhancing compound using pregenene extract from corals.		

Of South African origin

Species name: *PK1RS4 virus in buffalo*	Kingdom: Virales	No Image Available
Brief description of species: Virus strain associated with foot and mouth infection in cattle.		
Distribution: Cosmopolitan	No of documents: 1	
US2011014232A1		
Detail: New variant of foot and mouth disease virus which can be used as vaccine antigens.		

Of South African origin

Species name: *Plectranthus hadiensis*	Kingdom: Plantae	
Brief description of species: Medicinal herb from which extracts are taken for treatment of bacterial infections.		
Distribution: Cosmopolitan	No of documents: 1	
WO2008001278A		
Details: Preparations for the treatment of bacterial and fungal infections, to pharmaceutical compositions comprising the biologically active compounds from Plectranthus.		

With South African distribution

Species name: *Plectranthus hilliardiae*	Kingdom: Plantae	
Brief description of species: New cultivar of plant. Horticulture. Also known as the Candle Plant or Spur Flower.		
Distribution: Cosmopolitan	No of documents: 6	
US2005114972P1 USPP13858P2 USPP15542P2 USPP15543P2 USPP15563P2 USPP16002P3 (US Plant Patents)		
Detail: A new cultivar of Plectranthus, one parent of which is P.hilliardiae. The records are exclusively for US Plant Patents.		

With South African distribution

Species name: *Plectranthus myrianthus*	Kingdom: Plantae	
Brief description of species: Tall annual or weakly perennial herb, found on woody or rocky hillsides.		
Distribution: Cosmopolitan	No of documents: 1	
WO2008001278A2		
Detail: Extract from plant as anti-microbial compound.		

With South African distribution

Species name: *Priestleya tomentosa*	Kingdom: Plantae	
Brief description of species: A shrub which is endemic to South Africa.		
Distribution: Endemic	No of documents: 3	
US6534527B2 US2002025300A1 US2004013752A1		
Detail: Used in a herbal mix of an anti smoking compound.		

With South African distribution

Species name: *Protea pulchra*	Kingdom: Plantae	
Brief description of species: Synonym for Protea burchellii, a medium-sized, winter-flowering shrub.		
Distribution: Endemic	No of documents: 4	
EP0877756B1 US6909032B2 US2002108144A1 WO1997028185A1		
Detail: Protea used in the development of an anti microbial protein.		

Of South African origin

Species name: *Rhodosporidium toruloides*	Kingdom: Fungi	No Image Available
Brief description of species: Rhodosporidium toruloides is an oleaginous yeast. It is a red basidiomycetous isolated from wood pulp from conifers. Rhodosporidium toruloides has been linked to bovine mastitis.		
Distribution: Cosmopolitan	No of documents: 1	
WO2005100569A2		
A process for obtaining an optically active epoxide , the polypeptide being a polypeptide encoded by a gene of a yeast cell.		

Of South African origin

Species name: *S. cerevisiae strain PPRI3338*	Kingdom: Fungi	No Image Available
Brief description of species: Species of yeast used in wine making and bread baking.		
Distribution: Cosmopolitan	No of documents: 1	
WO2006051387A1		
Detail: The invention discloses a method of producing a micro-organism that can biosynthesise carnitine from a non-carnitine synthesising micro-organism.		

With South African distribution

Species name: *Scabiosa anthemifolia*	Kingdom: Plantae	
Brief description of species: Scabiosa is a genus in the teasel Family Dipsacaceae of flowering plants.		
Distribution: Cosmopolitan	No of documents: 3	
US2006137054P1 USPP19260P2 USPP12167P2 (US Plant Patents)		
Detail: Patents for new cultivars.		

With South African distribution

Species name: *Sceletium expansum*	Kingdom: Plantae	
Brief description of species: Traditional knowledge. All patents refer to Hottentot (actually Khoi, Khoikhoi or Khoekhoe) indigenous use of S. expansum.		
Distribution: Endemic	No of documents: 6	
US2005192339A1 US2005239841A1 US2007149600A1 WO2005051380A1 WO2005051381A1 WO2006114402A1		
Detail: Reference to hottentot (actually Khoi, Khoikhoi or Khoekhoe) use of plant. Patents refer to indigenous use but does not use the plant.		

With South African distribution

Species name: *Sceletium tortuosum*	Kingdom: Plantae	
Brief description of species: Sceletium tortuosum is a succulent herb commonly found in South Africa, which is also known as Kanna, Channa, Kougoed. Pharmaceutical extracts - traditional knowledge.		
Distribution: Uncertain	No of documents: 20	
US6288104B1 US2005192339A1 US2005239841A1 US2007149600A1 US2009105281A1 US2009197823A1 US2009239884A1 WO1997046234A1 WO2005051380A1 WO2005051381A1 WO2010106494A1 WO2010106495A1 WO2010111136A2		
Detail: US6288104B1: Compounds containing mesembrine for use as seratonine inhibitors. US2009105281A1: Treatment for the immune system contains mesembrine. WO1997046234A1: Antidepressant including mesebrine.		

Of South African origin

Species name: *Sclerochiton ilicifolius*	Kingdom: Plantae	
Brief description of species: Plant growing in the Transvaal region of South Africa.		
Distribution: Endemic	No of documents: 22	
WO2010105014A; WO2008085575A; WO2007140195A; WO2007133184A WO2007133183A; WO2007103989A; WO2006113897A; WO2005020721A; WO2005016022A; WO2005014839A; WO2010323411A1; US2010261234A1; US2010095390A1; US2009130285A1; US2005170041A1; US2005112260A1; EP2090173A1; EP1653810B1; US2008020434A1; US2008015361A1; EP2194042A2; WO2007103389A2		
Detail: The plant is the source of monatin, a ‘super-sweetener’.		

With South African distribution

Species name: *Siphonochilus natalensis*	Kingdom: Plantae	
Brief description of species: Wild ginger is a forest floor plant with aromatic rhizomatous roots. Extracts from plant has medical uses		
Distribution: Endemic	No of documents: 3	
WO2007113698A2 US2010168227A1 US2009082433A1		
Detail: Plant extract used for an anti-allergy compound.		

Of South African origin

Species name: *Smelophyllum capense*	Kingdom: Plantae	
Brief description of species: The genus Smelophyllum is in the family Sapindaceae and contains just one Species. Extracts used for skin treatments.		
Distribution: Uncertain	No of documents: 1	
US5807555A		
Detail: A method and composition for topically administering a Smelophyllum capense extract as a cosmetic, dermatologic, or pharmaceutical composition to promote collagen synthesis.		

Of South African origin

Species name: *Sorangium cellulosum*	Kingdom: Bacteria	No Image Available
Brief description of species: Sorangium cellulosum is a soil-dwelling Gram-negative bacterium of the group myxobacteria.		
Distribution: Cosmopolitan	No of documents: 6	
WO2001064650A WO2001054689A US7435754B2 US2007122891A1 US2002198256A1 WO2000071563A2		
Detail: Used to extract epothilones for use in cancer treatments.		

With South African distribution

Species name: *Spiloxene schlechteri*	Kingdom: Plantae	
Brief description of species: Spiloxene is a genus of about 25 plant species belonging to the Hypoxidaceae family. Most Spiloxene species are native to South Africa.		
Distribution: Endemic	No of documents: 4	
US5609874A US4652636A EP0587396A1 EP0092226A2		
Detail: Extract from Spiloxene is used in anti cancer and anti viral treatments.		

Of South African origin

Species name: *Streptomyces platensis*	Kingdom: Bacteria	No Image Available
Brief description of species: A bacterium that produces platensimycin as one of numerous secondary metabolites. This molecule is an inhibitor of many dangerous bacteria.		
Distribution: Cosmopolitan	No of documents: 1	
US7745644B2		
Detail: Fermentation of a nutrient medium with a eubacterium Streptomyces sp. yields a novel antibacterial (antibiotic) compound.		

With South African distribution

Species name: *Sutherlandia tomentosa*	Kingdom: Plantae	
Brief description of species: It has a strong reputation as a cure for cancer and now increasingly as an immune booster in the treatment of HIV/AIDS.		
Distribution: Uncertain	No of documents: 1	
WO2008065473A1		
Detail: An anti-diabetic compound using extracts from Sutherlandia.		

With South African distribution

Species name: *Tapinanthus kraussianus*	Kingdom: Plantae	
Brief description of species: Tapinanthus is a genus of plant in family Loranthaceae. It contains some 33 species. Methods and cuttings for mass propagation of plant parasites.		
Distribution: Uncertain	No of documents: 4	
EP1418800B1 US6792715B2 US2003029078A1 WO2003005804A1		
Detail: Method of plant propogation where parent plant has a parasite. Note that this plant is not the focus of the invention.		

Of South African origin

Species name: *Tarchonanthus camphoratus*	Kingdom: Plantae	
Brief description of species: Tarchonanthus camphoratus, is a shrub or small tree, widespread in Africa south of the Sahel		
Distribution: Cosmopolitan	No of documents: 1	
WO1994009631A1		
Detail: Use of Tarchonanthus camphoratus parts and its derivatives in insect-repelling, anti-irritating, soothing, anti-oedema, decongesting formulations and compositions.		

Of South African origin

Species name: *Tulbaghia violacea*	Kingdom: Plantae	
Brief description of species: Tulbaghia violacea is a plant species indigenous to southern Africa and is used locally as a herbal remedy/ medicine to treat several ailments. Recently it was demonstrated to have androgenic and anti-cancer properties in vitro.		
Distribution: Endemic	No of documents: 2	
WO2007003287A; US2009275472A1		
Detail: Extracts from plants used as anti microbial preparation as plant protection agents.		

With South African distribution

Species name: *Turnera capensis*	Kingdom: Plantae	
Brief description of species: A synonym for Piriqueta capensis. Herb growing in southern Africa.		
Distribution: Cosmopolitan	No of documents: 2	
WO2008071684A2 EP1932531A1		
Detail: Extract from any species of turnera which can be used in a treatment for sexual dysfunction.		

With South African distribution

Species name: *Umtiza listeriana*	Kingdom: Plantae	
Brief description of species: Umtiza is a monotypic genus in the legume family containing the single species Umtiza listeriana. This tree is endemic to South Africa. In long lists of species that can be utilised for cosmetic or pharmaceutical formulation		
Distribution: Endemic	No of documents: 2	
US2009208432A1 WO2007128725A1		
Detail: Bark from tree used in UV skin treatment. Listed in claim as one of a number of species that can be used in the invention.		

With South African distribution

Species name: *Vernonia kraussii*	Kingdom: Plantae	
Brief description of species: Synonym of Vernonia oligocephala, a widely distributed plant in South Africa, it occurs in wooded rocky grassland.		
Distribution: Cosmopolitan	No of documents: 1	
WO2000043025A1		
Detail: A pharmaceutical preparation for treating viral infections including powder derived from Vernonia Oligocephalus plant species.		

With South African distribution

Species name: *Wahlenbergia procumbens*	Kingdom: Plantae	
Brief description of species: Also known as the wild violet.		
Distribution: Cosmopolitan	No of documents: 1	
US2008184425P1 (US Plant Patent)		
Detail: A new horticultural cultivar of the species.		

Of South African origin

Species name: *Withania species*	Kingdom: Plantae	
Brief description of species: Withania is a genus of flowering plants in the nightshade family. Two of the species, W. somnifera (Ashwagandha) and W. coagulans (Ashutosh booti), are economically significant, and are cultivated in several regions for their medicinal uses.		
Distribution: Cosmopolitan	No of documents: 1	
EP1208845A1		
Detail: A treatment for sexual dysfunction using extracts of Withania.		

With South African distribution

Species name: *Zantedeschia sprengeri*	Kingdom: Plantae	
Brief description of species: Synonym for Zantedeschia pentlandii. New cultivars in horticulture. Also mentioned as a possible moisturizer in cosmetic composition.		
Distribution: Cosmopolitan	No of documents: 23	
US2002184689P1 US2004055064P1 US2004216199P1 US2004216200P1 US2007039082P1 US2007186323P1 US2010223703P1 US2010223704P1 USPP11001A USPP13393P2 USPP14063P3 USPP14844P3 USPP14849P2 USPP14850P2 USPP15282P2 USPP15642P3 USPP15664P3 USPP18110P3 USPP18281P3 USPP18833P2 USPP21244P2 USPP21245P2 US2006070148A1		
Detail: New horticultural cultivars of the species developed in various locations across the world. Note that these are US Plant Patents and not utility patents.		

With South African distribution

Species name: *Zygozyma oligophaga*	Kingdom: Fungi	No Image Available
Brief description of species: Zygozyma is a genus of fungi in the family Dipodascaceae.		
Distribution: Uncertain	No of documents: 5	
EP0505567A1 EP0769557A1 US5336619A US5508461A US5512465A		
Detail: A species which is used in the production of butanediol.		

Other Species

The following species appear in patents and are relevant to South Africa. However, they are excluded from the analysis because they are not the focus of the claimed invention or for similar reasons. They are therefore included in this section for the sake of completeness and in case the information is of interest to others in future research.

Species name: *Aloe pretoriensis*	Kingdom: Plantae	
Brief description of species: Smaller single stem blue-green aloe from S Africa, Zimbawe and Swaziland. Like other aloes, this species is used medicinally		
Distribution: Cosmopolitan	No of documents: 2	
EP0519758A1 US5477000A		
Detail: Literature reference regarding callus formation.		

Species name: *Anas smithi*	Kingdom: Animalia	
Brief description of species: Cape Shoveller Duck. Included in long list of bird species illustrating potential for patented method.		
Distribution: Cosmopolitan	No of documents: 1	
US2005079491A1		
Detail: Long list of avian species, invention is to identify presence of biological substances from bird s in a sample.		

Species name: *Aspalathus capitata*	Kingdom: Plantae	
Brief description of species: Legume of the same genus as that which produces Rooibos tea.		
Distribution: Endemic	No of documents: 1	
US5693361A		
Detail: Decorative foliage preservative that can be used on A. capitata.		

Species name: *Bambusa balcooa*	Kingdom: Plantae	
Brief description of species: Bambusa balcooa or the Balcooa Bamboo is a clumping bamboo of Indian origin. It is popular with the Vietnamese as food, and can be used as a short life timber for temporary constructions.		
Distribution: Cosmopolitan	No of documents: 1	
Detail: WO2010113020A1: Bambusa used to provide xylan to evaluate enzymatic substrate in isolation odf polypeptide for pulping industry.		

Species name: *Barbus andrewi*	Kingdom: Animalia	
Brief description of species: The Cape whitefish or Berg-breede River whitefish is a ray-finned fish species in the family Cyprinidae.		
Distribution: Endemic	No of documents: 2	
US2009238930A1 WO2009102781A1		
Detail: The invention relates to powdered, protein-rich comestibles and methods for production using fish. Whitefish is listed as one possible source of proteins to be use in the invention.		

Species name: *Bunolagus monticularis*	Kingdom: Animalae	
Brief description of species: A genetically modified rabbit comprising at least one edited chromosomal sequence. Long list of rabbit spp features this animal.		
Distribution: Uncertain	No of documents: 1	
US2011023140A1		
Detail: Genetically modified rabbits for research into mammalian diseases. The claims lists all rabbit species.		

Species name: *Burkholderia tuberum*	Kingdom: Bacteria	No Image Available
Brief description of species: Burkholderia tuberum is a species of proteobacteria that is capable of symbiotic nitrogen fixation with the legume Aspalathus carnosa.		
Distribution: Uncertain	No of documents: 3	
WO2010139957A1 WO2010139958A1 WO2010139959A2		
Detail. Alginate polymers for overcoming drug resistance in bacteria. Not the focus of the invention.		

Species name: *Caesia contorta*	Kingdom: Plantae	
Brief description of species: Hybridised maize plant based on research into nucleic acid molecules associated with oil in plants.		
Distribution: Uncertain	No of documents: 1	
US2007039069A1		
Detail: Not the focus of the invention.		

Species name: *Calanus brevicornis*	Kingdom: Animalia	
Brief description of species: Calanus is a genus of marine copepod in the family Calanidae. Anti microbial agent from Calanus spp.		
Distribution: Uncertain	No of documents: 1	
WO2010049454A2		
Detail: Appears in a long list of species, not the species used in the invention.		

Species name: *Candida albicans strain ATCC PTA-5316 (MA7327)*	Kingdom: Fungi	No Image Available
Brief description of species: Candida albicans is a diploid fungus that grows both as yeast and filamentous cells and a causal agent of opportunistic oral and genital infections in humans.		
Distribution: Cosmopolitan	No of documents: 2	
WO2005009391A2 EP1651628B1		
Detail: C. albicans used as a control during production of an antibiotic compound.		

Species name: *Ceratotherium simum simum*	Kingdom: Animalia	
Brief description of species: White rhino - Listed in gene amplification research. Nucleotide sequences encoding CD44 proteins.		
Distribution: Cosmopolitan	No of documents: 2	
WO2005034984A1 US7141364B1		
Detail: Not the focus of the invention.		

Species name: *Craterostigma wilmsii*	Kingdom: Plantae	
Brief description of species: A resurrection species that is thought to rely primarily on the protection of cellular components during drying to survive desiccation.		
Distribution: Uncertain	No of documents: 2	
WO2005030965A2 US2008010698A1		
Detail: Not the focus of the invention.		

Species name: *Culex tigripes*	Kingdom: Animalia	
Brief description of species: Culex is a genus of mosquitoes, and is important in that several species serve as vectors of important diseases. Patent for insecticide compound.		
Distribution: Cosmopolitan	No of documents: 3	
EP1845781B1 US2008269252A1 WO2006097588A1		
Detail: An insecticide product which can target C. tigripes.		

Species name: *Delosperma ecklonis*	Kingdom: Plantae	
Brief description of species: Delosperma is a genus of around 100 species of succulent plants. Method for the cryopreservation and long term storage of one or several types of cells.		
Distribution: Cosmopolitan	No of documents: 2	
WO2010094747A1 EP2221362A1		
Detail: Methods Patent for cryopreservation of cells method.		

Species name: *Gladiolus grandiflorus*	Kingdom: Plantae	
Brief description of species: Genetic control of ethylene biosynthesis in plants. G grandiflorus listed as plant that could be applicable		
Distribution: Uncertain	No of documents: 5	
Detail: Not focus of inventions. Appears in a long list of plants.		

Species name: *Helicoverpa armigera*	Kingdom: Animalia	
Brief description of species: The cotton bollworm, corn earworm or Old World bollworm, Helicoverpa armigera, is a moth, the larvae of which feed on a wide range of plants, including many important cultivated crops.		
Distribution: Cosmopolitan	No of documents: 1	
US6180098B2		

Species name: *Lampranthus sociorum*	Kingdom: Plantae	
Brief description of species: Lampranthus sociorum is a species of plants in the family Aizoaceae. Patent for novel Aromatic Acyltransferase Genes.		
Distribution: Uncertain	No of documents: 1	
US2009288225A1		
Detail: Literature reference.		

Species name: *Leonotis dysophylla*	Kingdom: Plantae	
Brief description of species: Leonotis is a genus of flowering plants in the family Lamiaceae. Breath freshener, solvent for which comes from plant extract.		
Distribution: Endemic	No of documents: 1	
EP0321180A1		
Detail: One of a large range of solvent producing species given as examples.		

Species name: *Lolium rigidum*	Kingdom: Plantae	
Brief description of species: Lolium is also known as ryegrass, an important feed crop.		
Distribution: Cosmopolitan	No of documents: 1	
WO2007031735A2		
Detail: Used as a control for controlling herbicide resistant plants.		

Species name: *Mycosphaerella africana*	Kingdom: Fungi	No Image Available
Brief description of species: This genus contains over 10,000 species. The patent involves the detection of mycosphaerella using the polymerase chain reaction.		
Distribution: Uncertain	No of documents: 1	
US2002115084A1		

Species name: *Myxozyma kluyveri*	Kingdom: Fungi	No Image Available
Brief description of species: A soil-borne species of the genus Myxozyma. A mention in a long list of yeast species in patent for a non-conventional yeast arabinose transporter.		
Distribution: Endemic	No of documents: 1	
WO2007143247A2		
Detail: Species comes up in long lists.		

Species name: *Myxozyma lipomycoides*	Kingdom: Fungi	No Image Available
Brief description of species: A method for producing geranylgeraniol and/or farnesol from cells belonging to a number of genera.		
Distribution: Endemic	No of documents: 2	
EP1219704A2 EP1219714A2		
Detail: Species appears in long lists.		

Species name: *Oldenburgia grandis*	Kingdom: Plantae	
Brief description of species: Oldenburgia grandis is a shrub or small, gnarled tree in the family Asteraceae. It occurs in the mountains around Grahamstown in South Africa.		
Distribution: Endemic	No of documents: 1	
US2002132021A1		
Detail: The species appears in a long list of species from which extracts elicited with acetic acid.		

Species name: *Pachytichospora transvaalensis*	Kingdom: Fungi	No Image Available
Brief description of species: Production of a product in a microbial fuel cell. Also used to test anti-cholestrol component for comestibles.		
Distribution: Uncertain	No of documents: 6	
WO2009070022A1 EP1206939B1 US7413740B2 US7754204B2 US2008260709A1 US2005244426A1		
Detail: Not the focus of invention in any case. Just listed as a yeast with certain properties.		

Species name: *Pelea capreolus*	Kingdom: Animalia	
Brief description of species: The Grey Rhebok inhabit grassy, montane habitats, and carry a woolly grey coat to insulate them from the cold across southern Africa. Used in patent to test gene amplifier.		
Distribution: Cosmoplitan	No of documents: 4	
US7141364B1 US2008003595A1 US2010075310A1 WO2006119466A2		
Detail: Appears in references or as a test species for a primer.		

Species name: *Pichia euphorbiiphila*	Kingdom: Fungi	No Image Available
Brief description of species: Pharmaceutical preparations. Genus listed in claims as having suitable properties.		
Distribution: Uncertain	No of documents: 3	
EP1486493A1 US7659409B2 US2005107621A1		
Detail: Appears in very long lists of fungi with specific properties, but not directly associated with invention.		

Species name: *Pinus patula*	Kingdom: Plantae	
Brief description of species: Pine tree from central America, grown extensively across the world as a commercial crop.		
Distribution: Cosmopolitan	No of documents: 1	
WO2010113020A		
Detail: Feedstock for deveolpment ofpolypeptide with a-glucuronidase activity that can degrade glucuronoxylan molecules. Pinus is not the focus of the invention.		

Species name: *Protea rubropilosa*	Kingdom: Plantae	
Brief description of species: Production of allite and its use as a sweetener. extracts from Transvaal sugarbush.		
Distribution: Endemic	No of documents: 1	
WO1997042339A1		
Detail: Literature reference.		

Species name: *Putterlickia retrospinosa*	Kingdom: Plantae	
Brief description of species: Unresolved species name. Listed in patent as plant with antibiotic properties.		
Distribution: Uncertain	No of documents: 11	
US2006269485A1 US2007292355A1 US2007292461A1 US2008063607A1 US2008206161A1 US2008292560A1 US2008299220A1 US2010159035A1 WO2007099396A2 WO2007113830A2 WO2008075207A2		
Detail: List of plants with antibiotic properties. Not the focus of the invention.		

Species name: *Rhodocoma arida*	Kingdom: Plantae	
Brief description of species: The Restionaceae is a family of rush like plants largely from the southern hemisphere.		
Distribution: Uncertain	No of documents: 3	
US7576213B2 US2007105721A1 WO2005061515A1		
Detail: Vinylogous 4-Hpyrones and their use in promoting plant growth. Plant listed in claim but not focus of the invention.		

Species name: *Ruschia indurata*	Kingdom: Plantae	
Brief description of species: Plant forming caespitose rounded clumps with grey-green leaves. A method of producing a plant secondary metabolite. Plus several patents with long lists of species.		
Distribution: Endemic	No of documents: 1	
WO2005012507A1		
Detail: A method of producing a plant secondary metabolite. The species appeares in several other patents in long lists of species.		

Species name: *Secale africanum*	Kingdom: Plantae	
Brief description of species: A single species of wild rye found only in South Africa and endemic to that country. Long lists of species included in patents for agricultural plant genetics.		
Distribution: Endemic	No of documents: 11	
EP1953235A2 EP2080769A2 EP2096177A2 EP2199304A1 US5332408A US2008318790A1 WO1990006375A1 WO2005014828A2 WO2005014828A2 WO2007087815A2 WO2010037402A1		
Detail: Crop plant used to test methods for analysing DNA identification methodology.		

Species name: *Senecio citriformis*	Kingdom: Plantae	
Brief description of species: Native to southern Africa, this slow-growing shrub-like plant has blue-green tear-shaped leaves and clustering tiny yellowish flowers. Long lists of species included as suitable targets in patents for agricultural plant genetics.		
Distribution: Endemic	No of documents: 2	
WO2006133970A2 US2009307801A1		
Detail: Crop plants listed as targets for invention.		

Species name: *Spodoptera triturata*	Kingdom: Animalia	
Brief description of species: The Lawn worm (Spodoptera triturata) is an Afrotropical moth of the Noctuidae family.		
Distribution: Cosmopolitan	No of documents: 4	
WO2003074716A2 WO2003074715A2 US2006078973A1 US7700833B2		
Detail: Listed as an insect from which nucleic acid can be extracted.		

Species name: *Sporobolomyces kluyveri-nielii*	Kingdom: Fungi	No Image Available
Brief description of species: A basidiomycetous yeast from Southern Africa.		
Distribution: Endemic	No of documents: 3	
WO2006034811A2 WO2005026269A1 US2004175407A1		
In long lists of patents for biological cell coatings and reporter genes.		

Species name: *Taxeobacter ocellatus*	Kingdom: Bacteria	No Image Available
Brief description of species: Proteins taken from species. Long list of species showing ID methods in patents.		
Distribution: Uncertain	No of documents: 4	
WO2005086794A2 US2010267012A1 US2009068641A1 US2005250135A1		
Detail: Methodology for identifying microbes - not focus of invention		

Species name: *Tilletia transvaalensis*	Kingdom: Fungi	No Image Available
Brief description of species: Tilletia is a genus of smut fungi in the Tilletiaceae family. Species in this genus are plant pathogens that affect various grasses. Long list of yeast species in relation to fungicides and plant health formulations.		
Distribution: Uncertain	No of documents: 8	
US2010035753A1 US2010197741A1 US2010209410A1 WO2005122770A2 WO2008095890A2 WO2009037242A2 WO2009040397A1 WO2009060012A2		
Detail: Plant pathogen listed as species which is a potential target species but not focus of invention.		

Species name: *Tobrilus diversipapillatus*	Kingdom: animalia	No Image Available
Brief description of species: Nematode worm. Patent for study of nematode life strategy in soil.		
Distribution: Cosmopolitan	No of documents: 2	
EP1613772B1 WO2004090164A2		
Detail: Methodology for examination of soil health by studying nematodes.		

Species name: *Trichoderma reesei*	Kingdom: Fungi	No Image Available
Brief description of species: Trichoderma reesei is a mesophilic and filamentous fungus. It is an anamorph of the fungus Hypocrea jecorina. T. reesei has the capacity to secrete large amounts of cellulolytic enzymes.		
Distribution: Cosmopolitan	No of documents: 1	
US2010015660A1		
Detail: Literature references.		

Species name: *Trichosporon terrestre*	Kingdom: Fungi	No Image Available
Brief description of species: Trichosporon is a genus of anamorphic fungi in the family Trichosporonaceae. All species of Trichosporon are yeasts with no known teleomorphs. Patent for the production of heterocyclic compounds from bacteria		
Distribution: Unknown	No of documents: 1	
WO1997031912A1		
Detail: Species listed in experimental data for use of Sporangium sp as the focus of the invention.		

Species name: *Urginea rubella*	Kingdom: Plantae	
Brief description of species: Synonym for Drimia calcarata. Used in medicinal compounds.		
Distribution: Cosmopolitan	No of documents: 4	
US2004082521A1 US2005026849A1 US2006205679A1 WO2004087121A2		
Detail: Listed as a plant containing glycosides. Not the focus of the invention.		

Species name: *Vanderwaltozyma polyspora*	Kingdom: Fungi	No Image Available
Brief description of species: A yeast used in a method for producing a transgenic plant cell,		
Distribution: Unknown	No of documents: 14	
US2010037350A1 US2010081179A1 US2010081183A1 US2010037350A1 US2010129886A1 US2010203211A1 US2010317072A1 US2010317735A1 US2010317882A1 US2010333234A1 WO2008043849A2 WO2008135931A2 WO2009009836A1 WO2010059539A2		
Detail: Appears in long lists to test methodologies for various processes. Not the focus of the invention.		

Species name: *Helichrysum crispum*	Kingdom: Plantae	
Brief description of species: Helichrysumi (n the sunflower family) occurs in Africa (with 244 species in South Africa), Madagascar, Australasia and Eurasia.		
Distribution: Uncertain	No of documents: 8	
WO2008033112A1		
Detail: Cited in long lists as a species which may be a source of phytochemicals.		

Species name: *Cercopithecus pygerythrus*	Kingdom: Animalia	
Brief description of species: Vervet monkey - widely ranging monkey. Pharmaceutical research.		
Distribution: Cosmopolitan	No of documents: 14	
EP0557876A1 EP1133558B1 EP1721979B1 US6469150B1 US6489445B1 US6495736B1 US6803453B1 US7041463B2 US7393634B1 US2005278798A1 US2003082660A1 US2010021888A1 WO2001090134A1 WO2005103702A2		

Appendix 1.
Distribution map of GBIF records in South Africa by taxonomic kingdom.