

DISS. ETH NO. 23585

Mayan phytotherapy in Guatemala: a transdisciplinary study for ethnographic documentation and local empowerment

A dissertation submitted to
ETH Zurich

to attain the degree of

DOCTOR OF SCIENCES of ETH ZURICH
(Dr. sc. ETH Zürich)

presented by

MARTIN HITZIGER

M. Sc. Umweltnaturwissenschaften (Univ. Bayreuth)
M. Sc. Decision Sciences (LSE London)

Born July 27th 1984
citizen of the Federal Republic of Germany

Accepted on the recommendation of

Prof. Dr. Peter Edwards
Prof. Dr. Michael Heinrich
Dr. med. Merlin Willcox
Dr. Pius Krütli

2016

**Mayan phytotherapy in Guatemala:
a transdisciplinary study for
ethnographic documentation
and local empowerment**

Summary

Biomedicine is the dominant global medical system, though it remains functionally weak in many developing countries. Due to its reductionist focus on experimental clinical effectiveness, biomedicine tends to disregard systemic aspects of health and disease. In contrast, many traditional, alternative or complementary systems in medically pluralistic countries are more holistic in their approach and emphasise systemic aspects of health and contextualized efficacy. The World Health Organization has a policy of engaging with these traditional medical systems, especially where they can contribute to intercultural health systems and improve health care. In Guatemala, traditional Maya medicine is neglected, little known and poorly institutionalized, while the national biomedical health system fails to address the needs of the indigenous population. Drawing on concepts of transdisciplinary research, this dissertation describes a collaborative study aimed at documenting Mayan phyto-therapeutic knowledge and practice, and fostering intercultural health care.

Fieldwork was conducted from 2013 to 2015. Main partners were Councils of Maya Elders in the Kaqchikel (highlands) and the Q'eqchi' (lowlands) linguistic areas, who facilitated contacts with reputed Maya healers in their areas. The National Cancer Institute (INCAN) represented the biomedical health system. Del Valle University of Guatemala collaborated in the botanical work, and especially in the identification of plant specimens. All field research was embedded in a transdisciplinary process in which scientists, Councils of Elders, healers and INCAN co-designed, co-steered and partly co-conducted the project. The ethno-pharmacopoeias of the two linguistic areas were documented by collecting medicinal plants and recording how they were used by the Mayan healers. Semi-structured interviews conducted during an earlier phase of the research were analyzed to produce a synthesis of the role played by phyto-therapy in Mayan medicine. Medical practice was documented by observing 187 healer-patient consultations of one Kaqchikel healer. An observational case study design was developed and applied to describe Mayan patients health-seeking pathways and Mayan treatment interventions, as well as to test the potential of collaborative research methods in fostering intercultural health. Results were disseminated in validation workshops and by contributing to an easily accessible book publication in local languages.

This dissertation, which is one of few major investigations of Mayan medicine in Guatemala, presents by far the largest comparative collection of medicinal plants applied by Mayan healers. The findings demonstrate how recent changes in plant availability and disease epidemiology have led to cultural adaptations in the ethno-pharmacopoeia of the Kaqchikel. They also illustrate the complexity of Mayan phyto-therapy and describe Mayan healing in the framework of balancing the patient by strengthening the energetic relations between the universe, the medicinal plants and the patients. Furthermore, they demonstrate how the abstract worldview reflected in *Raxnaq'il nuk'aslemal* or 'well-being in our life' systematically translates into a holistic yet personalized medical practice of enormous scope. Some case studies suggest surprising outcomes of Mayan medical treatments. However, while being rich and deep, Mayan medicine is also highly diverse and the consensual body of knowledge of healers seems limited, at least at the level of operational phyto-therapeutic practices.

This study was one of the first major collaborative projects specifically designed to empower local partners in developing countries, an objective that has often been recommended but rarely implemented. It addressed the interests of all partners and incorporated their contributions, thus generating value in terms of their own criteria. For many elders, this was an important reason for participating. The systematic research design, which involved workshops, comparative diagnoses and patient referrals, was a product of the multilateral collaboration with councils, healers and INCAN. It emphasized repeated personal interactions in different formats, and included facilitation, translation and mediation by intermediaries with whom the partners had established trust relations. As a result, existing networks were strengthened and new ones initiated, which enabled learning, both within and between medical systems. In turn, the partners highlighted important research questions, contributed to a multifaceted approach that embraced their perspectives, and provided manpower, skills and expertise. In short, their contributions were crucial to the success of the research.

In summary, this research addresses two challenges to intercultural health in medically pluralistic health systems. On the one hand, it demonstrates the scope, richness and depth of Mayan phyto-therapeutic knowledge, and substantively extends the knowledge base that is required to actively manage contributions of Mayan medicine to intercultural health in Guatemala. On the other hand, it presents innovative tools for intercultural transdisciplinary collaboration in developing countries, and demonstrates their value for both scientific and applied ends, even in a context as difficult as Guatemala. Whilst the approach would certainly need to be adapted, its general features are transferable to other settings and could provide a promising avenue to empower indigenous institutions, reduce structural violence and foster intercultural health. Expanding upon these or similar approaches and combining them with additional elements bears great promise for public health in developing countries.

Zusammenfassung

Das biomedizinische Gesundheitssystem ist heutzutage global dominierend, ist jedoch in vielen Entwicklungsländern wenig funktional. Auf Grund eines reduktionistischen Ansatzes, der hohen Wert auf Auswirkungen einzelner Wirkstoffe in experimentellen Studien legt, werden systemische Aspekte außerdem tendenziell vernachlässigt. Viele traditionelle, alternative oder komplementäre Heilkundesysteme, die oft stark regional verankert sind, ergänzen die biomedizinische Denkschule mit einem ganzheitlichen Ansatz, der hohen Wert auf systemische Aspekte und medizinische Wirksamkeit im Alltagskontext legt. Die Weltgesundheitsorganisation erstrebt daher den Aufbau einer Wissensbasis, die es erlaubt traditionelle Heilkundesysteme aktiv zu nutzen und in interkulturelle medizinische Versorgung einzubinden. In Guatemala existiert die traditionelle Medizin der Maya-Bevölkerung, die jedoch auf gesamtstaatlicher Ebene wenig bekannt, vernachlässigt und nicht institutionalisiert ist. Gleichzeitig ist die biomedizinische Versorgung schlecht und zielt an den Bedürfnissen weiter Teile der indigenen Bevölkerung vorbei. In dieser Dissertation wurde ein partnerschaftlicher Ansatz mit lokalen Akteuren gewählt, um das heilpflanzliche Wissen der Maya und seine Anwendung zu dokumentieren und um Entwicklungen in Richtung einer interkulturellen medizinischen Versorgung anzustoßen. Dabei werden Konzepte angewendet, die in der transdisziplinären Forschung entwickelt wurden.

Die Feldarbeiten wurden von 2013 bis 2015 durchgeführt. Hauptpartner waren Ältestenräte der Kaqchikel (Hochland) und Q'eqchi' (Tiefland) Maya, die Kontakte mit angesehenen Heilern ihrer jeweiligen Gegenden herstellten. Das Nationale Krankenhaus für Onkologie (INCAN) nahm als Repräsentant des nationalen biomedizinischen Gesundheitssystems teil. Die Universität del Valle übernahm die botanische Bestimmung der gesammelten Herbarbelege, welche im dortigen Herbarium aufbewahrt werden. Die gesamte Feldarbeit war in einen transdisziplinären Prozess eingebettet, in dem Forscher, Ältestenräte, Heiler und INCAN die Forschungsstrategie von Beginn an zusammen entwickelten, die Feldarbeit gemeinsam leiteten und teilweise auch gemeinsam durchführten. Die Feldarbeit umfasste mehrere Hauptelemente. Eine Herbarsammlung dokumentiert das medizinalpflanzliche Wissen von 10 Heilern der beiden Maya Sprachgruppen. Eine Analyse von Interviews aus einer vorherigen Forschungsarbeit stellt übergreifende Aspekte der Pflanzenheilkunde aus der Sicht der Maya dar. Die Beobachtung von 187 Patientenkonsultationen dokumentiert die ganzheitliche medizinische Praxis einer Kaqchikel Heilerin. Ein kollaboratives Fallstudiendesign in Zusammenarbeit mit INCAN erlaubt es, die Krankheitsgeschichte und die medizinischen Behandlungen der Patienten von Mayaheilern umfassend zu rekonstruieren und zeigt die Potentiale einer Patienten-zentrierten interkulturellen Zusammenarbeit zwischen Biomedizinern und traditionellen Heilern auf. Die Ergebnisse wurden den Ältesten und Heilern in Workshops vorgestellt und validiert und sind in eine leicht zugängliche Buchpublikation auf Spanisch eingeflossen.

Diese Dissertation ist eine der wenigen umfassenden Untersuchungen der Maya-Medizin in Guatemala. Sie präsentiert die bei weitem grösste publizierte vergleichende Sammlung guatemaltekescher Medizinalpflanzen und zeigt kulturelle Anpassungen der Kaqchikel Heiler an die veränderte Verfügbarkeit von Medizinalpflanzen und an das Aufkommen neuer Wohlstandskrankheiten. Sie illustriert die Komplexität der Maya Pflanzenheilkunde und beschreibt, wie Heiler das Gleichgewicht und die innere Harmonie der Patienten

wiederherstellen, indem sie die energetischen Beziehungen zwischen dem Kosmos, den Medizinalpflanzen und den Patienten beeinflussen. Dieses Konzept des Gleichgewichts und der Harmonie *Raxnaq'il nuk'aslemal* spiegelt sich in einem systematischen Behandlungsansatz, der eine grosse Vielfalt von Behandlungsmethoden individualisiert einsetzt. Einige Fallstudien legen erstaunliche Wirkungen der Mayabehandlungen nahe. Während die Maya Medizin reich an Wissen und von grosser Tiefe ist, scheint sie jedoch auch sehr uneinheitlich zu sein. Zumindest in Hinsicht auf angewandte Aspekte der Pflanzenheilkunde scheint das den Heilern gemeinsame Wissen begrenzt.

Diese Dissertation beschreibt eines der ersten grösseren transdisziplinären Forschungsprojekte in Entwicklungsländern, die lokale Partner stärkt – eine Strategie, die oft gefordert aber selten umgesetzt wird. Die Forschung bezog Ziele und Beiträge aller Partner ein und führte daher zu einem Nutzen gemäss deren eigenen Massstäben. Dies war für viele Älteste und Heiler ein wichtiger Grund sich einzubringen und zu öffnen. Die multilaterale Zusammenarbeit mit Ältesten, Heilern und INCAN war die erste Kombination von Workshops, vergleichenden medizinischen Diagnosen und Patientenverweisen in einer konsistenten und systematischen Forschungsstrategie. Vielfältigen Möglichkeiten für persönlichen Austausch sowie der Mediation durch akzeptierte Vermittler, zu denen die Partner bereits Vertrauensbeziehungen besaßen, wurde besonderer Wert zugemessen. Dies stärkte bereits existierende Beziehungen und initiierte neue Netzwerke, stärkte Vertrauen und führte zu Lerneffekten sowohl bezüglich des eigenen, als auch des jeweils anderen medizinischen Systems. Im Gegenzug wiesen die Partner auf interessante Forschungsfragen hin, trugen zu einem Forschungsansatz bei, der vielfältige Perspektiven einbezog, und stellten Arbeitskraft, Fähigkeiten und Expertise bereit, welche dem Forschungsteam fehlten. Kurz, ihre Beiträge führten zu einer innovativeren und umfassenderen Forschungsarbeit.

Diese Arbeit nimmt sich zweier Herausforderungen für interkulturelle Gesundheitssysteme in medizinisch pluralistischen Entwicklungsländern an. Einerseits zeigt sie die Breite, Reichhaltigkeit und Tiefe des medizinischen Wissens der Maya. Dies stellt eine beträchtliche Erweiterung des Wissens dar, welches zur aktiven Nutzung der Maya-Medizin in einer interkulturellen medizinischen Versorgung in Guatemala notwendig ist. Andererseits schlägt diese Arbeit innovative Methoden für interkulturelle transdisziplinäre Zusammenarbeit in Entwicklungsländern vor. Deren Wert erweist sich sowohl in wissenschaftlicher als auch in angewandter Hinsicht, selbst in einem Kontext, der so herausfordernd ist wie der guatemalteckische. Während die Methoden sicherlich an andere Kontexte angepasst werden müssen, scheinen ihre allgemeinen Merkmale übertragbar zu sein und stellen eine vielversprechende Möglichkeit dar indigene Institutionen zu stärken, strukturelle Gewalt zu verringern und interkulturelle medizinische Versorgung zu initiieren. Solche oder ähnliche Herangehensweisen zu verbreiten und zusätzliche Elemente zu integrieren kann daher von großem Nutzen für öffentliche Gesundheitssysteme in Entwicklungsländern sein.

Resumen

El sistema médico dominante a nivel global es la biomedicina, sin embargo, este presenta muchas debilidades a nivel funcional en muchos países en desarrollo. Debido a su enfoque reduccionista, orientado hacia la efectividad clínica experimental, esta tiende a ignorar aspectos sistémicos de la salud y la enfermedad. En contraste, muchos sistemas tradicionales, alternativos o complementarios en regiones médicamente plurales, complementan el modelo biomédico con enfoques holísticos enfocados en aspectos sistémicos de la salud y eficacia contextualizada. La Organización Mundial de la Salud, por tanto, ha promovido la construcción de una base de conocimiento que permita el manejo de los sistemas médicos tradicionales y el aprovechamiento de sus contribuciones potenciales hacia sistemas médicos interculturales. En Guatemala, la medicina tradicional Maya ha sido ignorada, es poco conocida y no se han hecho intentos por institucionalizarla, mientras que el sistema de salud biomédico fracasa sistemáticamente en el abordaje de las necesidades de salud de la población indígena. Sobre la base de conceptos de investigación transdisciplinaria, esta disertación utiliza un enfoque colaborativo para proveer documentación profunda sobre el conocimiento y prácticas fitoterapéuticas Mayas, y para la promoción de un sistema de salud intercultural.

El trabajo de campo se llevó a cabo entre 2013 y 2015. Los socios principales fueron los Consejos de ancianos Mayas en las áreas etnolingüísticas Kaqchiquel (Tierras altas) y Q'eqchi' (Tieras bajas), quienes facilitaron el contacto con Médicos Mayas de renombre en sus regiones respectivas. El Instituto Nacional de Cancerología (INCAN) fue la institución representante del sistema de salud biomédico. La Universidad del Valle de Guatemala participó en la identificación botánica de los especímenes. Todo el trabajo de campo estuvo incrustado en un proceso transdisciplinario en el cual científicos, consejos de ancianos, médicos mayas y personal del INCAN, co-diseñaron, co-dirigieron y en parte co-condujeron el proyecto de principio a fin. Se implementaron varias líneas de trabajo de campo. Las dos etno-farmacopeas se documentaron a través de la recolección plantas medicinales y el registro de su uso por parte de 10 médicos mayas. Sobre la base de una fase previa de investigación, se analizaron entrevistas semi-estructuradas para reconstruir una síntesis de la fitoterapia desde la Cosmovisión Maya. Las prácticas médicas se documentaron a través de la observación de 187 consultas de pacientes de una médica maya. Se diseñó un estudio de caso que se desarrolló y aplicó con el fin de describir las trayectorias de búsqueda de atención en salud de los pacientes Mayas y los tratamientos, así como para evaluar el potencial de los métodos de investigación colaborativos en la promoción de la salud intercultural. Los resultados se diseminaron en talleres de validación y a través de la contribución en un libro publicado localmente en lenguaje accesible.

Esta disertación se encuentra entre las pocas investigaciones de gran magnitud sobre la medicina Maya en Guatemala. Asimismo, presenta la mayor colección comparativa de plantas medicinales aplicada por Médicos Mayas en Guatemala y demuestra las adaptaciones culturales recientes en la farmacopea Kaqchiquel que se han dado a raíz de cambios en la disponibilidad de plantas y epidemiología de las enfermedades. Ilustra la complejidad de la fitoterapia Maya y describe las prácticas médicas Mayas en el contexto del balance y fortalecimiento de las relaciones energéticas entre el paciente y el universo. Además, demuestra como la cosmovisión abstracta reflejada en el concepto *Raxnaq'il nuk'aslemal* – *bienestar en nuestra vida* se traduce sistemáticamente en prácticas médicas holísticas personalizadas de gran alcance. Algunos estudios de caso sugieren resultados

sorprendentes en los tratamientos. Sin embargo, aunque de gran riqueza y profundidad, la medicina Maya también es sumamente diversa. Por lo tanto, al menos a nivel operacional de prácticas fitoterapéuticas, el consenso es limitado.

Desde el enfoque aplicado, esta investigación se encuentra entre uno de los proyectos de mayor escala en países en vías de desarrollo enfocados en empoderar a los socios locales, una innovación comúnmente mencionada pero pocas veces puesta en práctica en la investigación norte-sur. Se abordaron los intereses de todos los socios y se incorporaron sus contribuciones, generando entonces valor en términos de los criterios propios. Para muchos ancianos, esta fue una importante motivación para involucrarse. La colaboración multilateral con consejos, médicos Mayas y el INCAN fue la primera en incorporar talleres, diagnósticos comparativos y referencias a pacientes en un diseño de investigación sistemático. Se enfatizaron las interacciones personales repetidas en los diferentes formatos, y se incluyó la facilitación, traducción y mediación de intermediarios con quienes los participantes tenían relaciones de confianza preexistentes. Como resultado, las redes preexistentes se fortalecieron y se construyeron otras, se establecieron relaciones de confianza y se promovió aprendizaje tanto dentro como entre sistemas médicos. Por su parte, los socios señalaron preguntas de investigación importantes, contribuyeron a un enfoque multifacético que incluyó sus propias perspectivas y aportó de forma importante en términos de mano de obra, habilidades y experiencia, de los cuales carecían los miembros del equipo de la ETH. En resumen, sus contribuciones también llevaron a una investigación más innovadora y exhaustiva.

Por lo tanto, esta investigación abordó dos retos a la salud intercultural presentes en sistemas de salud plurales. Por un lado, extendió sustancialmente la base de conocimiento que se requiere para incorporar las contribuciones de la Medicina Maya al sistema de salud intercultural en Guatemala; y demuestra la amplitud, riqueza y profundidad del conocimiento fitoterapéutico Maya. Por otro lado, presenta herramientas innovadoras para la colaboración transdisciplinaria intercultural en países en desarrollo y demuestra su valor para fines científicos y aplicados, incluso en un contexto tan difícil como el guatemalteco. Aunque ciertamente se necesitan adaptaciones para otros contextos, sus características principales parecen ser transferibles y proveen un camino prometedor para empoderar instituciones indígenas, reducir la violencia estructural y promover sistemas de salud interculturales. La expansión de este o enfoques similares y su posterior integración con elementos adicionales tienen un gran potencial para mejorar los sistemas de salud públicos en países en desarrollo.

Remarks

This is a cumulative thesis. It comprises four main chapters. An overall introduction and a conclusion connect the chapters, highlight their interconnections and mutual complementarities, and embed them in a wider context. However, each of the main chapters is derived from an originally independent publication. They were thus aimed at different audiences, employ different analytic and synthetic approaches, are published in different media and thus written in different styles.

In this dissertation, the four publications were combined, mostly without changes to their original content, text or writing styles (exceptions are marked in footnotes). The chapters thus have some limited degree of repetitiveness. Formatting was adapted such that pages, sections, tables and figures are numbered consistently throughout the text. Acknowledgements from the original papers were not copied. Instead, an overall acknowledgement section was added separately. Likewise, references of all chapters were combined.

The author rights are with the main author, as long as not contradicted by other regulations and agreements.

Content

1. Introduction	
1.1 Biomedicine and traditional medicine: complementary systems for global health	1
1.2 Health systems and medical pluralism in Guatemala.....	2
1.3 A transdisciplinary research process to document Mayan medicine and to foster intercultural health in Guatemala	4
1.4 Specific contributions and research questions	5
2. Mayan phytomedicine in Guatemala: Can cooperative research change ethnopharmacological paradigms?.....	7
2.1 Abstract	9
2.2 Introduction.....	10
2.3 Background	
2.3.1 The study area and its sociocultural history.....	11
2.3.2 Institutional platform & transdisciplinary (TD) project design.....	13
2.4 Methods	
2.4.1 Informant selection.....	14
2.4.2 Field research & botanical documentation	14
2.4.3 Database research & data analysis.....	15
2.5 Results & discussion	
2.5.1 Database representativeness for the indigenous groups.....	16
2.5.2 Database representativeness for Guatemalan medicinal flora.....	17
2.5.3 Database completeness & comprehensiveness.....	17
2.5.4 Structuring medical complexity	18
2.5.5 Ethno-pharmacopoeias reflect societal context.....	22
2.5.6 Ethno-pharmacopoeias reflect sociocultural history	22
2.5.7 Understanding medical change	23
2.6 Conclusion	24
3. Phyto-therapy in Mayan worldview - Preface.....	27
3.1 Introduction: Research on medicinal plants in Mesoamerica	29
3.2 Material aspects of Mayan phyto-therapy	
3.2.1 Preparation and application of medicinal plants.....	30
3.2.2 Complexity of Mayan phyto-therapies: a case description.....	31
3.3 Spiritual aspects of Mayan phyto-therapy	
3.3.1 Medicinal plants: Our elder siblings.....	33
3.3.2 Mayan healers: strengthening relations between plants, patients & universe	34
3.3.3 Relations with the universe: geomorphological exposition, lunar cycles, and the sacred calendar <i>Cholq'ij</i>	37
3.4 Conclusion	40
4. Holistic treatment strategies in Mayan medicine: an observational case study	41
4.1 Abstract	43
4.2 Introduction: Holistic interventions in Mayan healing.....	44
4.3 Background and methods	
4.3.1 The healer – a short portrait.....	45
4.3.2 Ethics & institutional framework	46

4.3.3 Data collection & analysis	46
4.4 Results	
4.4.1 Sample description.....	47
4.4.2 Problem and treatment classification, and treatment strategies.....	47
4.4.3 Case vignettes	
4.4.3.1 Don José's family: Struggling with the impacts of a sent disease	50
4.4.3.2 Manuela's children: alleviating the emotional impact of a deceased father...52	
4.4.3.3 Doña Juana and Marco: seeking to transform their life	52
4.5 Discussion	
4.5.1 Methods appraisal	54
4.5.2 Content appraisal.....	55
4.6 Conclusion & outlook.....	56
5. From medical pluralism to intercultural health care through patient-centered collaboration: bridging biomedical and traditional medicine in Guatemala	59
5.1 Abstract.....	61
5.2 Introduction.....	62
5.3 Background	
5.3.1 Boundary management – a research design to create access, build trust and bridge knowledge systems	63
5.3.2 Barriers to intercultural health in Guatemala.....	64
5.4 Methods	
5.4.1 Research design.....	65
5.4.2 Research implementation	66
5.5 Results	
5.5.1 Illustrated case studies	
5.5.1.1 Don Manuel (Cog_Kaq_05)	67
5.5.1.2 Doña Maria (Cog_Kaq_06)	68
5.5.2 Process outcomes	69
5.5.3 Impact evaluation	71
5.6 Discussion	
5.6.1 Collaborative observational case research: An innovative design.....	73
5.6.2 Collaborative observational case research: fostering intercultural health	74
5.7 Conclusion	75
6. Ethnographic documentation and empowerment for intercultural health	
6.1 Ethnographic documentation: A rich but diverse tradition	
6.1.1 Richness and depth of Mayan medicine.....	77
6.1.2 Consistency and consensus in Mayan medicine.....	78
6.1.3 Implications of the collaborative approach for the ethnographic research.....	79
6.2 Transdisciplinarity: empowerment for intercultural health.....	80
6.3 Outlook.....	82
6.4 Conclusion	83
Acknowledgements.....	85
Author information & CV	86
References	89
Appendix: Voucher Collection	101

Figures

Figure 1: Physio-geographic map and bio-geographic zonation of Guatemala	11
Figure 2: Consensus factors (F_{ic} , y-axis) as a function of relative share of Use Reports	23
Figure 3: Relation of the 20 Nawales [calendar signs] to parts of the human body	39
Figure 4: Associations of attended problems, treatment elements, and medical functions	49
Figure 5: Boundary management to facilitate preconditions to intercultural health.....	63
Figure 6: Actors and relations involved in the study	66

Tables

Table 1: Sociocultural background of the 10 healers.....	16
Table 2: Overview of Use Reports (UR's) and identifications in both linguistic areas	17
Table 3: Example data of some of the most frequently reported species	19
Table 4: Medical use classification	20
Table 5: Full list of species with four or more Use Reports in one and the same class.....	21
Table 6: Classification of observed problems and treatments.....	48
Table 7: Interests that motivated the main involved partners	65
Table 8: Health-seeking pathways of patients in Guatemala.....	70
Table 9: Biomedical diagnoses of 35 patients in the two linguistic areas.....	70
Table 10: Project evaluations of 8 key collaborators	71

1. Introduction

1.1 Biomedicine and traditional medicine: complementary cultural systems for global health care

The dominant approach in Western medical practice is biomedicine, the application of natural sciences, especially the biological and physiological sciences, to clinical medicine. While biomedicine is diverse and complex, it is based upon the assumption that the body and disease are “natural” and bound to the realm of observable facts. In the tradition of the Cartesian separation of mind and body, disease is thought as understandable in isolation, and diagnosis and treatment follow a reductionist approach focused on the illness, rather than the patient itself (Ahn et al. 2006a; Rhodes 1996). Despite obvious advances in biomedicine, this approach disregards a variety of other determinants of health such as psycho-somatic interactions (Kiecolt-Glaser et al. 2002) and complex, chronic syndromes that evolve through interactions of many different factors (Ahn et al. 2006b). In recent years, new streams in biomedicine – for example, psychoneuroimmunology, which deals with interactions between psychological perceptions, neurological effectors and immunological responses – have emerged that venture beyond the usual limitations of this explanatory model (Antoni et al. 2006; Eisenberger & Cole 2012). Nevertheless, the gold standard for evaluating biomedical effectiveness remains randomized controlled trials (RCT) which are designed to assess the internal validity of standardized, isolated agents or interventions, applied in experimental settings, and controlled for any ‘placebo effects’ (Kao et al. 2008). This methodology both reflects and reinforces the hallmarks of biomedical thought.

In contrast to biomedicine, many traditional, alternative or complementary systems of medicine¹ are expressions of world-views that complement this paradigmatic biomedical model with a holistic approach focused on well-being. They explicitly include aspects of mind-body medicine, focus on nutrition and synergetic natural products, consider social and cultural context, and emphasize intense hands-on interaction between patients and practitioners (Cassidy 2006; Micozzi 2006a, 2006b; Spelman 2006). Furthermore, medical efficacy – the perceived impact of treatment interventions in contextualized routine applications – depends on economic, technological, socio-cultural and physiological factors and might, even in biomedicine, deviate from experimental effectiveness² (Etkin 1988; Farmer et al. 2006; Lee 1982; Victora et al. 2004; Waldram 2000). Thus, medical efficacy in the public health arena, and specifically in multicultural developing countries involves complex causal networks of biophysical, behavioral and other factors, which usually cannot be assessed in RCT’s due to pragmatic and/or conceptual reasons. Thus, they tend to remain excluded from biomedical attention. Other approaches to assess and advance

¹ The terms traditional, alternative or complementary medicine refer “the total sum of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures (...)” and are frequently used interchangeably (World Health Organization 2016).

² The differentiation between efficacy and effectiveness refers to notions of measuring the impact of medical interventions. In line with (Etkin 1988; Waldram 2000), we use ‘effectiveness’ to refer to an interventions’ impact in an “ideal setting”, as determined by an RCT. It thus exclusively measures internal validity of the intervention-outcome relationship, mostly from a physiological point of view. We use ‘efficacy’ to refer to the perceived benefit of an intervention in routine conditions, thus measuring its external validity in the respective cultural, economic and societal context of application. However, there also is contrary usage of terminology (Victora et al. 2004).

medical practice that take into account external validity are thus equally valid and relevant (Fønnebø et al. 2007; Graz et al. 2007; Patwardhan & Mashelkar 2009; Verhoef et al. 2005; Verpoorte et al. 2005; Victora et al. 2004). From this more inclusive vantage point, traditional, alternative and complementary systems of medicine have much to offer, on the grounds of their accessibility and affordability, their often respected and locally influential healers, their holistic and synergistic approach, their cultural acceptability that enhances efficacy and triggers placebo effects or meaning responses, and even the clinical effectiveness of some of their treatments (Bodeker & Kronenberg 2002; Bodeker et al. 2006; Liverpool et al. 2004; Moerman & Jonas 2002; Moerman 2013; Montellano 1975; Niemeyer et al. 2013; Pedersen & Baruffati 1985, 1989; Szawarska 2015).

From a global perspective, (Lee 1982) observation still holds true: Biomedicine, while dominant in terms of power, prestige and wealth, remains in many countries functionally weak in terms of equitably availability and widespread utilization. About half the population in many industrialized countries uses complementary or alternative medicine, and up to 80% of the population in many developing countries rely on traditional medical care (Bodeker 2001; Bodeker & Kronenberg 2002). Thus, medical pluralism – the coexistence and parallel use of traditional, alternative or complementary systems of health care – remains the rule rather than the exception (Sudhinaraset et al. 2013). Furthermore, one third of the world's population lacks regular access to biomedicine, especially in African, Asian, and Latin American countries (Bodeker et al. 2005). Many of these countries suffer from what has been described as a double burden of disease, with health systems struggling to control infectious diseases whilst at the same time being affected by a rising incidence of non-communicable diseases associated with Western diets and increasing affluence (Boutayeb 2006). Thus, to fulfill its mission of improving global health care, WHO's strategic goals ever since 1978 include building the knowledge base that will allow to manage traditional medical systems actively and to harness their potential contributions to global health (World Health Organization 1978, 2013). There has been extensive research on several traditional medical systems, notably Chinese medicine, Ayurveda, (European) herbalism, homeopathy and some other traditions (Micozzi 2006c). Attempts to integrate these systems with biomedicine, either by integrating different systems in education and practice, or by taking a parallel approach of supporting them in separation (Bodeker 2001), were at least partially successful in countries such as China, India and Switzerland (World Health Organization 2013). Other traditions, such as Mayan medicine in Guatemala remain, however, little known, neglected, poorly institutionalized and even suppressed.

1.2 Health systems and medical pluralism in Guatemala

Guatemala, a medium-sized country on the Central American Isthmus, has a population of 15 million people, 40% of whom are indigenous, belonging to more than 20 mostly Mayan groups (Instituto Nacional de Estadística 2014). Of these people, 52% live in rural areas, and 51% are below the poverty line (Becerril-Montekio & Luis López-Dávila 2011). Non-communicable syndromes are on the rise, and predicted to become leading causes of mortality (PAHO 2007). The Guatemalan biomedical health system consists of four levels: specialized national hospitals, regional department hospitals, municipal health centers, and hamlet-based health posts staffed with a medical student or health workers (Bhatt 2012). While access to local health posts is usually given, specialized institutions remain out of reach in many rural areas, quality of services may be perceived as insufficient, economic

costs of treatments can be prohibitive, a multitude of languages hamper communication, different cultural background contribute to lack of understanding and sociocultural prejudices prevail (Annis 1981; Berry 2008; Chomat et al. 2014; Cosminsky 1983; Farmer 2005; Hawkins & Adams 2007). Furthermore, the Guatemalan history of oppression and conflict as described in (Luján 1999) has created a situation of inequality and structural violence against the indigenous population which prevents the indigenous population from receiving adequate biomedical health care. Thus, the biomedical health system does not address the needs and expectations of the Mayan population who thus resort to other options (Cortez and Cerón 2008; Fort and Morales 2004). Thus, the relevance of Mayan medicine as source of primary health care becomes evident.

Mayan medicine is a complex and diverse system in which the principal elements are a) therapists or healers in different specialties, b) operational categories for the classification of diseases and, c) therapeutic resources, both material (plants, animals, minerals) and spiritual, to treat physical, mental, social and spiritual problems (Villatoro 2001). A vast array of anthropological literature on Mayan medicine focused on describing practices, beliefs and social change (Hart 2008; Logan & Morrill 1979; Molesky-Poz 2006; Orellana 1987; Press 1975), communicative aspects of intra-cultural medical encounters (Harvey 2003, 2013), similarities and differences with biomedical systems (Berlin & Jara 1993; Goldman & Gleit 2003; Luber 1999), or phyto-therapeutic knowledge (Balick & Arvigo 2015; Berlin & Berlin 1996; Bye et al. 1995; Heinrich et al. 1998; Kufer et al. 2005; Michel et al. 2007; Pöll et al. 1995; Roys 1931). However, due to weak institutions and a recent civil war in which traditional healers were explicitly targeted, most of this research was undertaken in Mayan communities in México, which are linguistically and historically different from those in Guatemala. In consequence, even leading Guatemalan experts on ethnomedicine doubt the very existence of a Mayan medical tradition that would go in substance and depth beyond limited amounts of scattered heuristics held by individual folk healers³.

Some policies directed at promoting traditional and complementary medicine in Guatemala do exist, mostly on a constitutional level as an outcome of the 1996 peace treaties. However, these have had little impact upon medical practice (Nigenda et al. 2001), and there are neither formalized educational opportunities nor public funding schemes to support or institutionalize Mayan medicine (Bodeker et al. 2005). An analysis of models of intercultural care in five Latin American countries found a lack of trust between traditional practitioners and western health centers in the Guatemalan case study and concluded that in this country the intercultural model did not work (Mignone et al. 2007). On the Mayan side, Councils of Elders constitute a traditional form of internal political organization. However, in many areas they are weak and mostly lack capacity for initiating and maintaining collective action. They are furthermore hampered from advancing any political agenda by the general context of structural violence (Cosminsky 1983; Luján 1999).

³ Dr. Armando Cáceres, oral communication at the 1st Centro-American Congress on Natural Medical Products, held in Guatemala City on April 23rd 2015.

1.3 A transdisciplinary research process to document Mayan medicine and to foster intercultural health in Guatemala

Literature of relevance to intercultural health in developing countries is fragmented and mostly confined to studies on medicinal plants and local health beliefs, practices, perspectives and attitudes as those described in other sections of this dissertation. However, most of it was researched in unilateral scientific endeavors in which locals were merely considered “informants”. Even though some research projects certainly aimed at producing locally relevant knowledge in collaborative ways, few were serious about involving local and indigenous stakeholders into strategic project decisions (e.g. Berlin & Berlin 1996, 2004; Kayombo et al. 2007). Strengthening collaborative research approaches that produce real value to local communities was thus highlighted as top priority for future research (Etkin & Elisabetsky 2005; Vandebroek 2013). Specifically, collaborative research methods have been called for to strengthen local stakeholders, to provide real value to local communities and to ensure equitable representation of diverse interests and perspectives in the research process.

These are core objectives of ‘transdisciplinary’ (TD) research, a concept first defined in 1972 as “multi-level coordination of the entire education / innovation system” (Jantsch 1972). It has since been redefined several times, and has gained conceptual and methodological depth. It has also developed into different streams, which are applied in fields such as sustainability science and public health (Bergmann et al. 2010; Haire-Joshu & McBride 2013; Pohl & Hirsch Hadorn 2007). The main characteristics of TD are to

1. relate scientific and real-world problems,
2. design and conduct the research in close collaboration between scientists and practitioners,
3. produce new knowledge by integrating scientific and extra-scientific insights on epistemic, socio-organizational or communicative levels
4. widely disseminate results, aimed at both scientific audiences and relevant stakeholder groups (modified from Häberli & Grossenbacher-Mansuy 1998; Jahn et al. 2012; Pohl & Hirsch Hadorn 2007).

Drawing from the field of TD research, a collaboration between ETH Zurich and five Councils of Mayan Elders initiated in 2010 to address the lack of scientific knowledge about Mayan medicine in Guatemala. Five linguistic groups participated in this collaboration, the Mam, K’che, and Kaqchikel Maya in the highlands, and the Q’eqchi’ and Mopán Maya in the lowlands of Petén. The project aimed to document Mayan medicine as practised by 13 Mayan healers in each of these linguistic and cultural areas and to strengthen its practice by using a novel TD approach to enable networking among various Guatemalan actors. Its defining feature was the application of a bidirectional emic-etic research design to foster self-reflexivity between participating researchers, Councils of Elders and Mayan healers. The methodology and first results are outlined in several publications aimed at both scientific and Guatemalan audiences (Berger-González et al. 2016a, 2016b, 2016c; Consejo Mayor de Médicos Maya’ob’ por Nacimiento 2016). The first phase of this research included many Mayan practitioners and covered many medical aspects. It was also successful in building initial trust and networks. However, the fieldwork was completed in less than three years. This meant that data collection was mostly limited to a single, albeit extensive, interview with each healer – thus methodologically excluding any direct data on medical practice – and non-Mayan Guatemalan stakeholders were to only limited extends involved in the collaboration.

The work described here represents a second research phase, which extended the fieldwork to 5 years. The focus was sharpened on Mayan phyto-therapy and the number of actively participating Councils was reduced to two, for pragmatic reasons, due to preliminary experiences and data from the first phase, and to allow intense interactions and in-depth research. All five Councils remained however included in the TD umbrella process and participated in strategic events. The overall objective was to provide an in-depth documentation of Mayan phyto-therapeutic knowledge and practice, and to design expanded TD approaches for strengthening intercultural health between traditional and biomedical health systems in Guatemala and beyond.

1.4 Specific contributions and research questions

Chapter 2 describes the process and outcomes of a comprehensive ethno-pharmacological documentation of Mayan phyto-therapeutic *knowledge* by means of plant collection and semi-structured interviews. It focuses on the following research question: What characterizes the regional ethno-pharmacopoeias of two linguistic Mayan groups in Guatemala? The results are discussed with emphasis on three aspects:

- 1) The TD design in the light of the representativeness, completeness and comprehensiveness of the gathered information,
- 2) The use of the International Classification of Diseases (ICD-10) in intercultural comparative research, and
- 3) The two region's ethno-pharmacopoeias in the light of their divergent societal contexts and sociocultural histories.

This chapter also provides the relevant background on Guatemalan geography and biodiversity, and the sociocultural history of the two linguistic groups that mainly participated in the second project phase. To enable this research, the TD process with Councils of Elders was intensified and extended through collaboration of Del Valle University in botanical species identification. It presents the largest collection of Guatemalan medicinal plants published to date, and compares the phyto-therapeutic knowledge of Mayan healers in the two linguistic areas. It also is one of the first major collaborative ethno-pharmacological investigations in Central America and beyond, aiming not only at documenting traditional practice, but also at empowering its institutions.

Chapter 3 describes material and spiritual aspects of plant selection, preparation and application in the context of the Mayan worldview. Due to its nature as a book chapter, it does not explicitly put any specific research question. It focuses on the description of material aspects of medicinal plant preparation and application, the spiritual concepts of medicinal plants and their usage by healers, and concepts relating medicinal plants and phytotherapeutic healing to the wider Mayan cosmovision. It also presents background on historical research on Mayan phyto-medicine in México and Guatemala. The information is based on data from all lines of project research. Its depth and accuracy were validated by a Mayan editorial board. This chapter provides comprehensive synthesis of *emic meaning* across linguistic areas, and is thus complementary to chapter 1.

Chapter 4 goes beyond reported medical knowledge and meaning, and presents a semi-quantitative analysis of one healer's medical *practice*, derived from participant observation of a large number of patient consultations. Its research question is to elicit how abstract principles in Mayan medicine are reflected in everyday healer consultations. It also provides background on holistic medical systems. The data were partially gathered and the chapter co-written by Ana Vides, a researcher with background in psychology and medical

anthropology. It illustrates how the abstract Mayan worldview is translated into daily medical practice of enormous scope, in which phyto-therapeutic knowledge is embedded as one of the most important treatment aspects. It also demonstrates how systematic and biomedically plausible treatment modalities for particular problems are combined into complex personalized interventions for each patient history.

Chapter 5 presents a novel TD framework aimed at *linking biomedical and traditional health systems*. This is achieved by facilitating dialogue between scientists and political representatives of traditional societies and by comparatively diagnosing and following up the traditional treatment of patients. These patients act as “boundary subjects”, whose medical condition creates a shared reality between practitioners, despite of divergent cultural perceptions regarding their illness. This contribution thus addresses the following research question: Can research designs that integrate workshop approaches, comparative diagnoses and patient referrals, facilitated by boundary management, foster collaboration between biomedical and traditional health practitioners? The results are discussed with regard to the research designs potential to create access, build trust and bridge biomedical and traditional medical knowledge systems. It also provides background on structural violence as barrier to integrative medicine in developing countries, and on access and trust as requisites to link knowledge systems. This chapter is the first systematic application of a multilateral TD collaboration to bridge knowledge systems in medically pluralistic settings. It describes outcomes in the context of structural violence, and illustrates intercultural learning processes and impact triggered by this intervention in both knowledge systems.

Thus, while each chapter applies a different methodology, chapters 2 and 5 present innovative transdisciplinary approaches that are transferable to similar research questions in other settings. In terms of content, the dissertation starts with an analysis of medicinal plant species used in Mayan medicine (ch. 2). Subsequently, the focus widens to Mayan worldview on phyto-therapy (ch. 3), its holistic medical context (ch. 4), and collaborations between Mayan medicine and biomedicine (ch. 5). Chapter 6 connects the dots in a general discussion, outlook and conclusion. Specifically, it discusses how this dissertation advances research on intercultural health in Guatemala and beyond by (i) documenting Maya medicine and assessing its consistency, and (ii) providing local value, empowering stakeholders and building new networks.

2. Mayan phytomedicine in Guatemala: Can cooperative research change ethnopharmacological paradigms?

Original publication: Hitziger M, Heinrich M, Edwards P, Lopez M, Pöll E, Krütli P (2016): *Mayan Phytomedicine in Guatemala - Can Cooperative Research Change Ethnopharmacological Paradigms?* J. Ethnopharmacol. 186, pp. 61-72.

2.1 Abstract

Ethnopharmacological relevance: This paper presents one of the first large-scale collaborative research projects in ethnopharmacology, to bring together indigenous stakeholders and scientists both in project design and execution. This approach has often been recommended but rarely put into practice. The study was carried out in two key indigenous areas of Guatemala, for which very little ethnopharmacological fieldwork has been published.

Aim of the study: To document and characterize the ethno-pharmacopoeias of the Kaqchikel (highlands) and Q'eqchi' (lowlands) Maya in a transdisciplinary collaboration with the two groups Councils of Elders.

Materials and methods: The project is embedded in a larger collaboration with five Councils of Elders representing important indigenous groups in Guatemala, two of which participated in this study. These suggested healing experts reputed for their phytotherapeutic knowledge and skills. Ethnobotanical fieldwork was carried out over 20 months, accompanied by a joint steering process and validation workshops. The field data were complemented by literature research and were aggregated using a modified version of the International Classification of Diseases (ICD-10) and Trotter & Logan's consensus index.

Results: Similar numbers of species were collected in the two areas, with a combined total of 530 species. This total does not represent all of the species used for medicinal purposes. Remedies for the digestive system, the central nervous system & behavioral syndromes, and general tissue problems & infections were most frequent in both areas. Furthermore, remedies for the blood, immune & endocrine system are frequent in the Kaqchikel area, and remedies for the reproductive system are frequent in the Q'eqchi' area. Consensus factors are however low. The Kaqchikel, in contrast to the Q'eqchi', report more remedies for non-communicable illnesses. They also rely heavily on introduced species.

Discussion & conclusions: The transdisciplinary research design facilitated scientifically rigorous and societally relevant large-scale fieldwork, which is clearly beneficial to indigenous collaborators. It provided access and built trust as prerequisites for assembling the largest comparative ethnopharmacological collection, vastly extending knowledge on Mayan phytotherapy. The collection represents knowledge of the two groups' most reputed herbalists and is a representative selection of the Guatemalan medicinal flora.

ICD-10 proved useful for making broad comparisons between the groups, but more refined approaches would be necessary for other research objectives. Knowledge in the two areas is highly diverse and seems fragmented. New approaches are required to assess how coherent Mayan phytotherapy is. The documented 'traditional' ethno-pharmacopoeias demonstrate dynamic change and acculturation, reflecting the two linguistic groups' sociocultural history and context. This highlights the adaptive potential of phytotherapeutic knowledge and calls the equation of local indigenous pharmacopoeias with 'traditional' medicine into question. We suggest using the term 'local' pharmacopoeias, and reserving the term 'traditional' for the study of indigenous pharmacopoeias with a clear delineation of ancient knowledge.

2.2 Introduction

Ever since the Spanish conquest of Central America, local phytotherapy has captured the attention of western and, more rarely, native scholars. Individual investigations and systematic efforts of various Mexican institutions in all parts of México resulted in rich anthropological descriptions and inventories of medicinal flora containing several thousand species (Bye et al. 1995). Traditional medicine in the post-classic Mayan states in Guatemala received less attention, partly, because investigations were hampered by weak national institutions and a civil war. International efforts have focused upon pharmacological tests of selected species (Gridling et al. 2009; Madlener et al. 2009), local pharmacopoeias (Kufer et al. 2005; Pöll et al. 1995), or treatments of particular diseases or systems (Cáceres et al. 1995; Michel et al. 2007). A host of grey or unpublished literature of diverse quality also exists. However, only two systematic editions of Guatemalan pharmacopoeia have been compiled (Cáceres 2009; Roque 1941), listing about 100 and 40 medicinal plants, respectively. Of these, many are naturalized, cultivated or commercially available species likely to be derived from Mestizo concepts and knowledge. In contrast, systematic knowledge on medicinal flora and Mayan phytotherapy in Guatemala remains largely inaccessible.

‘Transdisciplinarity’ (TD) has been suggested as one avenue for strengthening ethnopharmacology. Very often TD has been defined as methodology that integrates the perspectives, objectives and tools of diverse disciplines (Etkin and Elisabetsky 2005). It is thus conceptualized as a research collaboration in which knowledge production and decision making power *remain unilaterally within academia*. Based on the perspectives of collaborative research (Arnstein 1969; Krütli et al. 2010; Stauffacher et al. 2008) this has to be considered *information* and *consultation* based approaches. In contrast, *collaboration* and *empowerment* aim at facilitating mutual learning and knowledge co-production by integrating non-academic stakeholders into the research process (Pohl et al. 2010). Such participatory collaborations involving local and indigenous institutions in all phases of research have been promoted to respect the Nagoya Protocol on Access and Benefit Sharing (Convention on Biological Diversity 2015), to improve comprehension of cultural constructions and social transactions (Etkin & Elisabetsky 2005) and to contribute to the survival of indigenous cultures (Martin et al. 2010). The International Cooperative Biodiversity Project project in Mexico was one pioneering example (Berlin & Berlin 2004). At smaller scale, similar concepts were implemented in Belize (Balick & Arvigo 2015, Pesek et al. 2010). While previous efforts certainly worked towards such goals, there has, however, been no attempt to integrate cooperative approaches systematically from study design to completion, and most remain conducted in a conventional fashion.

The TD approach taken in this study aimed to strengthen collaboration by:

- 1) Studying problems that are formulated and structured jointly or in close contact with (in this case indigenous) practitioners and those concerned.
- 2) Teams formed with disciplinary experts, but also with practitioners and other stakeholders.
- 3) Conducting research as a collaborative effort, involving close contact between researchers and practitioners.
- 4) Disseminating results among the wider public. (Häberli & Grossenbacher-Mansuy 1998 in Pohl & Hirsch-Hadorn 2007).

We focused at the following research question: What characterizes the regional ethno-pharmacopoeias of two linguistic Mayan groups in Guatemala? The results are discussed with emphasis on three aspects:

- 1) The TD design in the light of the representativeness, completeness and comprehensiveness of the gathered information,
- 2) The use of the International Classification of Diseases (ICD-10) in intercultural comparative research, and
- 3) The two region's ethno-pharmacopoeias in the light of their divergent societal contexts and sociocultural histories.

2.3 Background

2.3.1 The study area and its sociocultural history

Guatemala is a medium-sized country in the outer tropics (109000 km²) with a population of some 15 million people, located on the Central American isthmus (CIA 2015, Figure 1a). It comprises two major geological zones. As part of the Pacific ring of fire, its western and southwestern stretches along the Pacific coast are formed by volcanic highlands ("Altiplano") at altitudes between 1500 and 3000m, with the highest peaks reaching beyond 4000m. The eastern and north-eastern stretches are wide, plain to hilly limestone lowlands ("Petén"), mostly between 200 and 700m. The transitional zone towards the highlands in the west ("Verapaces") is also built on limestone. The region has one of the most diverse floras in the world (Myers et al. 2000), as a consequence its tropical location, its large altitudinal range, diverse habitats and geological conditions, and its location between the holarctis and the neotropis. As shown in Figure 1b, this flora has been classified into seven overarching biomes.

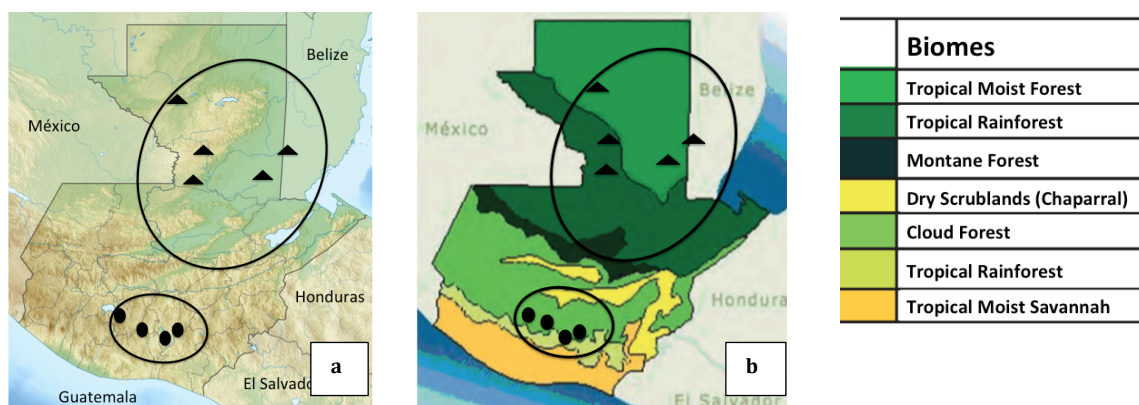


Figure 1a: Physio-geographic map of Guatemala. Highlands in the west and southwest alongside the Pacific, lowlands in the north and north-east towards the Carribean. Figure 1b: Bio-geographic zonation of major biomes according to (Castañeda 2008; CONAP 1999; Villar-Anleu 1998). Locations of healer's villages approximated with dots (Kaqchikel) and triangles (Q'eqchi'). Linguistic areas approximated with circles.

Culturally, Guatemala is part of Mesoamerica (Kirchhoff 1943). In the lowlands, Mayan cultures created flourishing city-states until the end of the so-called classic period (ca. 1000 A.D.), after which there are only few archaeological traces of populations. In the highlands, smaller political entities existed until the Spanish conquest in 1524 (Carcache 1994). More than 20 different linguistic groups still exist today, forming 40% of the population (Instituto Nacional de Estadística 2014). Two major groups were selected for

the study: the Kaqchikel in the highlands (451'000 speakers) and the Q'eqchi' in the Verapaces and Petén (800'000 speakers, Ethnologue 2015). This approach allowed us to compare linguistic groups and also to cover different floristic zones.

The Kaqchikeles were among the first groups in contact with the Spanish, who built their capitals next to the Kaqchikeles' ceremonial-theocratic population center. While the Kaqchikeles retained most of their lands until after Guatemalan independence, they were required to provide labor force to local Spanish lords, which often turned into slavery. In 1537, the crown introduced the "new laws of the Indies", providing some minimal humanitarian protection (Aguilar 1994). It also established so-called "reductions", forcing scattered hamlet populations to resettle in centralized villages where they could be better controlled, more easily converted to Christianity, and made to work on public projects (Carcache 1994). Since exchange between reductions was restricted, previously diffuse linguistic differences developed into local dialects, while Spanish gained prominence around the capital (Richards & Richards 1994).

In the region occupied by the Q'eqchi', the Spanish conquest took a different course. After several failed military expeditions, Dominican monks were successful in converting the population peacefully, and the former war zone was thus transformed into the Dominican Mission of the True Peace named "Verapaces". This put the Q'eqchi' directly under the control of the crown, and prevented any Spaniards from entering the region. The Dominicans defended this mission to the point of sacking Spanish settlers by means of Spanish military force (Saint-Lu 1994). Therefore, the Q'eqchi' were less rigorously separated into reductions, did not develop local dialects, and retained an identity towards their linguistic group in general (Herrera 1997). Around 1700 AD, the Spanish capital in the Kaqchikel area thus had a population of 30'000 non-indigenous people, whereas in all the Verapaces, accounts register only 20 non-indigenous families (Lutz 1994). The indigenous populations of Petén were only defeated in 1697 (Didier 1994), after which the lowlands fell almost unoccupied (Jones 1940).

With the liberal governments of independent Guatemala in the 19th century, the reductions system was abolished, but the indigenous population was also stripped of the minimal protection under Spanish rule (McCreery 1995a). Immigrants entered rural areas, including the Verapaces, where they acquired large plantations, deprived the population of their land and forced them into debt peonage (McCreery 1995b). Additionally, population growth was significant, and each generation of smallholders was forced to further subdivide the remaining lands or to migrate. By 1960, policies were approved to settle and develop the lowlands. A first road connection was established in 1965 (Riera 1997). By 1981, Petén's population had grown more than tenfold (Schwartz 1990), 85% of it indigenous (Adams 1997). During the Guatemalan armed conflict in the 70's and 80's, the military targeted indigenous villages and their leaders, with the Verapaces and Petén being at the heart of the conflict (Kahn 2006). A peace treaty was signed as recently as in 1996 (Adams 1997).

Therefore, the Q'eqchi', who had emerged from the colonial period with less experience of outside repression, migrated to occupy much of Petén and parts of Belize, vastly extending their historical core area in the Verapaces. The Kaqchikeles had been in contact with colonial and national society for much longer, remained in their original areas, and escaped some of the worst abuses of recent decades.

2.3.2 Institutional platform & transdisciplinary (TD) project design

In 2010, a Memorandum of Understanding (MoU) was established between the ETH Zurich, the Del Valle University of Guatemala and the Councils of Elders of 5 major linguistic Mayan groups. First contact with the Councils of Elders as officially recognized representatives of their linguistic groups was made through Cirilo Perez Oxlej, the indigenous itinerant ambassador of Guatemala (2008-2012). It was agreed to document Mayan medical culture using a TD approach. For this, 13 traditional healers of various specializations were interviewed in each linguistic area. They were selected by the Councils (i.e. from an emic viewpoint) for their high reputation and experience. This project has been thoroughly described elsewhere (Berger-Gonzalez et al. 2016b). During this process, the lack of information on Mayan phytotherapy in Guatemala became apparent. Thus the Councils suggested to document traditional phyto-therapeutic knowledge, to strengthen the identity of Mayan medicine, to build societal awareness, and to preserve the knowledge for future generations.

Negotiations commenced in September 2012. In an extension of the MoU, Del Valle University agreed to voucher the collection under permissions granted to its Herbarium, to identify botanical specimen and to train staff in fieldwork methods. The Councils agreed to scientifically publish results. They also agreed to facilitate contact with healers, to accompany fieldwork researchers and translate where required, and to select one person per group to be trained as fieldwork assistant. In turn, systematic activities would engage the elders and healers to discuss and steer the field research, to create opportunities for exchange and clarification of ambiguities, to contribute to understanding and appreciation of potential benefits, and thus to facilitate learning in the process of conducting the research. As part of the overall project, a chapter on Mayan phytotherapy would be contributed to a book on Mayan medicine, written from an emic perspective, in an accessible style and in local languages, and validated by a Mayan editorial board. This book "*Raxnaq'il Nuk'aslemal: Medicina Maya en Guatemala*" (Consejo Mayor de Médicos Maya por Nacimiento) was presented to project partners and representatives from politics and media in March 2016 in the National Presidential Palace in Guatemala City.

The TD process thus enabled the field research by empowering local collaborators: (1) The councils were from the outset involved in framing the research, (2) responsibility was shared between a coalition of local indigenous representatives, national botanical experts and international specialists in collaborative processes, (3) the botanical sampling was accompanied by iterative interactions that facilitated mutual learning on several levels, (4) the research was part of a wider effort to strengthen Mayan medical identity by collaboratively producing and disseminating systematic information, and providing opportunities for mutual understanding and networking with other sectors of Guatemalan society.

2.4 Methods

2.4.1 Informant selection

The informant selection was a two-step process, designed to access “emically eminent phyto-therapeutic specialists”. In a first step, ETH Zurich selected the Kaqchikel (highlands) and the Q’eqchi’ (lowlands) groups, to represent important floristic zones, due to preliminary data on relevance of phytotherapy in their respective medical traditions, and for practical reasons such as reliability, internal organization, legitimacy and rapport with healers. In a second step, their Councils chose healers with locally reputed specialist knowledge in phytotherapy. The strategy thus took advantage of local knowledge and perceptions of healer’s skill, experience and reputation. It furthermore built on existing networks and trust, which were extended and deepened by facilitating interactions throughout the research period.

2.4.2 Field research & botanical documentation

Fieldwork staff from Mayan councils and ETH were jointly trained at Del Valle University in spring 2013. Initial workshops between Mayan healers, Council members and ETH staff offered an opportunity for the collaborators to get to know each other and explore methods. The main sampling took place between September 2013 and May 2015. In the highlands, research was conducted in Spanish in which all healers are fluent. In the lowlands, research was conducted in Q’eqchi’, which required a council member to be present at all times to translate and also to increase trust. First visits to each healer were extensive and were always made by the first author. Several days were spent in free-listing medicinal species, recording local names, and in documenting uses, preparations, recipes, and other information pertinent to the healer. To obtain the fullest coverage possible, species were collected at different times of year and in different places. Especially in the lowlands, collections took place up to 100km from healer’s homes. This involved repeated follow-up visits, some of which were made by the trained assistants. Regular meetings with Council members were held throughout the fieldwork, which were important for securing feedback and resolving differences and misunderstandings.

Samples of all encountered medical species were collected, amending the free-listed information where required. Sampling locations and altitudes were recorded with GPS. Vouchers were delivered to the Herbarium of Del Valle University for identification, with some families cross-checked by experts in other herbaria. The main collection is stored at Del Valle University, while a duplicate collection is to be exported to ETH Zurich (pending due to the concerned institutions not having developed procedures for granting export permissions under the Nagoya protocol). All botanical names were validated in The Plant List (The Plant List 2013). Due to financial and time constraints, it was decided early on not to collect commonly known cultivated or marketed species which are shared widely among Guatemalan Indigenous and Mestizo groups.

Fieldwork ended in April 2015 with validation workshops in both groups, attended by council members and healers. These meetings were an opportunity to check local names and uses of species with healers, to clarify ambiguities, and to establish correspondences between collected species and uncollected use reports of other healers. In addition, the workshops were designed to report findings back to the community representatives in a culturally adapted form.

2.4.3 Database research & data analysis

Every record of a species being used by a healer was counted as use report (UR). Some species, mostly ubiquitous introduced or marketed species in cut, ground or processed form were not collected. To reduce the bias of systematically excluding important components of Mayan phytotherapy, in instances in which the UR referred to clearly defined common and widely recognized species like fenugreek (*Trigonella foenum-graecum* L.) or garlic (*Allium sativum* L.), the Latin binomials were inferred from general literature and validated with The Plant List (The Plant List 2013). As suggested in terms of good ethnopharmacological practice (Heinrich et al. 2009), the appendix specifies whether a species was identified by voucher specimen or literature research. Unidentified species were not included in the further analysis.

Representativeness of the collection was determined by the sampling design. In Section 2.5.1, botanical representativeness of the sample for the Guatemalan medicinal flora is analyzed in terms of covered altitudes and biomes. In Section 2.5.2, cultural representativeness for the phytotherapeutic traditions is analyzed in terms of decisions made in healer selection. To analyze for *completeness* and *comprehensiveness* of the database, Section 2.5.3. presents UR's and their repetitions, and numbers of identified species are compared with the national Vademecum of Medicinal Plants (Cáceres 2009).

In Section 2.5.4, a classification system of the recorded uses is presented, derived from the World Health Organization's International Statistical Classification of Diseases and Related Health Problems (ICD-10, World Health Organization 2015), modified in the light of emic Mayan conceptualizations and fieldwork constraints. The frequency of UR's in the different classes is presented in Section 2.5.5. In Section 2.5.6, the data is aggregated with Factor of Informant Consensus index, F_{IC} (Heinrich et al. 1998; Trotter and Logan 1986), to analyze for coherence of uses (Formula 1). The index derives from the difference of numbers of UR's (N_{UR}) and referred taxa (N_t), normalized by dividing by N_{UR} . It therefore specifies consensus or coherence in uses of a given taxa in the range of 0 ($N_{UR} = N_t$) and 1 ($N_t=1$).

$$F_{IC} = \frac{N_{UR} - N_t}{N_{UR} - 1} \quad \text{Formula 1}$$

This analysis is on the genus level since it has been argued that many well-known medicinal plants are actually found in 'plant complexes', i.e. different species with similar functions, appearances, often related phylogeny and vernacular names (Bye and Linares 2015, Linares and Bye 1987). Preliminary analyses provided indications of this being the case in Guatemala (Hitziger et al. 2016b).

The phytogeographic origins of the species were researched in the National Vademecum of Guatemalan Medicinal Plants (Cáceres 2009) and the Flora Mesoamericana (Missouri Botanical Garden 2015). These results are presented in Section 2.5.7.

2.5 Results & discussion

2.5.1 Database representativeness for the indigenous groups

The Kaqchikel Council suggested four healers to work with and the Q'eqchi' council suggested six. Since two of the latter were brothers working as a team and sharing most of their knowledge, they were treated as a single source of information. Table 1 presents information on the healers' sociocultural background and education. In both groups, they had roughly the same age and with a strong bias towards males. All healers specialized in phyto-therapy, almost all do also practice spiritual healing. The one female selected by the Kaqchikel council additionally works as a midwife. On all other variables there were differences. Kaqchikel healers have been, in contrast to Q'eqchi' healers, permanently resident in their municipality of birth, have received formal education, speak Spanish fluently and enjoy higher standards of living.

Table 1: Sociocultural background of the 10 healers (2 of them brothers and treated as single source of information) participating in the research. Spanish: Spanish fluency. E: Electricity in house. T: Tap water in house. F: Flushed toilet in house. This information was received in semi-structured interviews, and by field observations.

	Sex	Age	History of Migration	Western Schooling	Maya Specialization	Spanish	E.	T.	F.
Kaqchikel	M	56	Living in municipality of birth	Primary school	Herbalist	high	+	+	+
	M	47	Living in municipality of birth	Apprenticeship (nurse, dentist)	Herbalist, Spiritual Guide	high	+	+	+
	M	57	Living in municipality of birth	University degree (soc. sc.)	Herbalist, Spiritual Guide	high	+	+	+
	F	40	Living in municipality of birth	Apprenticeship (nurse)	Herbalist, Spiritual Guide, Midwife	high	+	+	+
Q'eqchi'	M	51	Verapaz --> Petén	Almost none	Herbalist, Spiritual Guide	very low	-	+	-
	M	63	Verapaz --> Petén	Almost none	Herbalist, Spiritual Guide	very low	-	+	-
	M	67	Living in municipality of birth	None	Herbalist, Spiritual Guide	low	+	+	-
	M	NA*	Petén --> Petén	None	Herbalist, Spiritual Guide	very low	-	-	-
	M	65 / 43	Petén --> Belize	Almost none / primary school	Herbalist, (Spiritual Guide)	low	-	-	-

*does not know

These differences reflect sociocultural context (see Section 2.3.1): the Kaqchikele's history of interaction with the nation's centers of development increased their fluency in Spanish, and is reflected in higher schooling levels and a higher standard of living. They settled into stable municipal groups ever since the establishments of the new laws of the Indies. In contrast, the Q'eqchi' were less rigorously reduced but, following clashes with large-scale coffee growers in the Verapaces in the 19th century, were forced to migrate to the sparsely populated lands of Petén. More recently, they were severely hit by the civil war.

The question of whether the healers' knowledge can be considered representative of the two groups phyto-therapeutic traditions needs to be answered in terms of how the healers were selected. It could be argued that the healers who agreed to participate were more innovative than the average, implying that 'traditionalists' were less well represented. However, the trust relations built with the Councils during this project should have minimized any bias. Furthermore, the Councils were asked to select locally eminent specialists in healing with plants, which they appear to have been done; all the chosen healers were experienced herbalists, and most of them also had a reputation as spiritual healers. Field insight further suggests that selection was done according to the agreed criteria; healers were contacted in diverse locations, surnames do not match the ones of the council members, and kinship relations between council members and healers seem to exist in only one single case. The over-representation of males, especially in the Q'eqchi' area, accords with the observation of few females participating as healers or priests in major ceremonial events. We conclude, therefore, that the healer selection represented two major healing specializations, and was representative of emic notions of healing reputation and knowledge in phytotherapy.

2.5.2 Database representativeness for Guatemalan medicinal flora

Figure 1 (Section 2.3.1) depicts the settlement regions of the two groups and the homes of the selected healers on a physio-geographic and a bio-geographic map. Altitudes of collections ranged from 100- to 600m in the Q'eqchi' area, and 1400- up to 2750m in the Kaqchikel area. These data show that in geo-botanical terms, the sampling covered most of Guatemala's terrestrial biomes and altitudinal ranges. In the lowlands, tropical moist forests and rainforests are covered, and in the highlands and towards higher levels of the pacific slope, tropical rainforests and cloud forests are included. The two coastlines, moist savannahs alongside the Pacific slope, as well as medium altitude montane forests in the Verapaces, and dry scrublands and the highest peaks in the highlands are left out. With the exception of Verapaces, however, these biomes occupy areas where the indigenous population density is very low. A final restriction was observed in the field, since a few species flowering in the treetops could not be collected. Overall however, the sampling covered a set of biomes that is representative of the Guatemalan terrestrial flora, with certain well-defined limitations.

2.5.3 Database completeness & comprehensiveness

A total of 1403 UR's were recorded, of which 1049 UR's were identified at least to family level. 736 UR's were supported by voucher specimen from the same healer and 176 UR's were supported by voucher specimen of other healers during the validation workshops. Another 137 UR's were identified by literature research. A total of 124 families, 399 genera and 530 species were identified. Taxa representing 354 UR's could not be identified and were excluded from further analyses. The list of UR's and identifications is detailed in the appendix. Table 2 summarizes this data by linguistic group. Out of 530 identified species, around 300 were reported only a single time, and only 60 were reported more than three times.

Table 2: Overview of Use Reports (UR's) and identifications in both linguistic areas.

	Only Q'eqchi'	Both Areas	Only Kaqchikel	Total
Total use reports	761	---	642	1403
Species	206	78	246	530
Genera	140	79	180	399
Families	21	63	40	124
Unknown use reports	284	---	70	354

The number of species identified is similar in both areas. Since there are no ethnobotanical data from earlier periods an assessment of potential knowledge loss is not possible. However, the linguistic groups' divergent migration histories or different levels of development are not reflected in different numbers of known medicinal plants. In this sense, the results of this overarching study contradict the smaller and localized investigation conducted in one migrant community in Petén by Nesheim et al. (Nesheim et al. 2006), who reported finding very little phytotherapeutic knowledge.

The number of identified species in each area is comparable to other ethnobotanical field campaigns in similar biomes, which often range between 200 and 600 species (Heinrich et al. 1998; Leonti et al. 2001). Compared to previously published knowledge in Guatemala, the present dataset is a huge step forward: The two ethno-pharmacopoeias are much

larger than might be supposed from the Guatemalan Vademecum of medicinal plants (Cáceres 2009). For 57 of the 101 species referenced in that compilation, a voucher specimen was collected, for 14 others a voucher of similar plants (same genus) was collected, and 15 were identified from literature. Only 15 species are not represented at all in the database. Thus, the vast majority of the commonly known medicinal plants represented in earlier compilations were re-identified. In addition, ca. 430 species not included in this previous compilation were recorded to be used for medicinal purposes.

2.5.4 Structuring medical complexity

Table 3 shows examples of some of the most commonly reported species, and the middle columns details their uses in both groups. As these tend to be very diverse, we developed a use classification with eleven classes. Several classes were taken from the ICD-10 without modification, while a few were merged into superordinate classes (e.g. Blood & Immune System” and “Endocrine, Nutritional and Metabolic Diseases”), and the “genito-urinary complaints” was split into “urinary system” and “reproductive system” due to clear distinctions of the systems in the data. The category of infectious diseases was split into “parasitic infections” and “other infections”. Parasitic infections were added to the digestive system, since field data do not allow a clear distinctions to be made between gastrointestinal problems caused by parasites and those due to other causes. Other infections were added to a relatively large class of “General Tissue Problems and Infections” due to very blurry distinctions made in Mayan medicine between a large variety of inflammatory or infectious problems and neoplastic or ulceratic tissue complaints that seem crosscutting to any classification into organ systems. This field observation is confirmed by literature sources describing medical concepts in Central America (Kufer et al. 2005). The “central nervous system” category was broadened to include behavioral disorders. A class of ‘spiritual-energetic uses’ was added due to its emic relevance, and for all other uses in various ICD-10 categories, the remnant class “other” was introduced. Most notably, it contains all UR’s referring to fever and sweating, since causes of these syndromes are manifold. The first three columns of Table 4 present the classes and common emic use concepts in each group.

Therefore, we had to modify the original categories considerably to accommodate emic conceptions of disease classifications and etiologies. Some authors would argue that it is better in these circumstances to adopt an entirely emic classification (Staub et al. 2015). However, since we are dealing with two cultural emics, this advice is of limited help. For example, in the Kaqchikel area, neoplasms are perceived to be genuinely related to ulcers, but clearly distinguished from rashes, insect bites and regular infections. In the Q’eqchi’ area, the equation of cancers and ulcers is the same, but additionally related to an even larger class of tissue-related problems. The class thus had to be wide, even though in the Kaqchikel area distinctions could have been more detailed. Furthermore, since the biomedical details leading to different ICD-10 categorizations could not be verified in the field setting, some simplifying assumptions had to be made. To overcome this problem literature recommends the use of the International Classification of Primary Care (ICPC) (Staub et al. 2015). However, even in this classification, many categories would have needed to be altered in very similar ways to the ICD-10. Thus lacking perfect solutions, our system was developed as a pragmatic way of accommodating the two groups of emic conceptions in a general overview of their pharmacopoeia. Other analyses with different objectives will however require adapted classifications.

Table 1: Example data of some of the most frequently reported species. Phytogeographic origin: Introduced (I), native (N). Habitat of collected specimen: Cultivated areas / gardens (C), open land (R), Forest (F). Source: Specimen voucher (V), literature identification of local name (L).

	Local names	Kaqchikel area: Uses and # of UR's	Q'eqchi' area: Uses and # of UR's	Origin	Habitat	Source	
<i>Prunus persica</i> (L.) Batsch	Durazno	Sacred, parasites, diarrhea, purgative, allergies, bronchitis, headache, skin infections, ulcers, cancer	4	0	I	R	V
<i>Senecio salignus</i> DC.	Chilca	Sacred, swellings, inflammations, blood circulation, diuretic, uric acid, colic, bilis, analgesic, relaxant, expectorant, strengthen immune system	3	0	N	R	V
<i>Sida acuta</i> Burm.f.	Escobillo, Mesb'eel	Uterus, stomach problems, hair loss	1	4	-	C, R, F	V
<i>Siparuna thecaphora</i> (Poepp. & Endl.) A.DC.	Chu' Che'		0	4	-	R, F	V
<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	Cola de Armado, Xye' Ajwech		0	4	N	R, F	V
<i>Tagetes erecta</i> L.	Flor de Muerte, Tu'tz'	Sacred, parasites, antibiotic, leukemia, colic, tetanus, stimulating immune system, wound healing, analgesic	4	3	N	R	V
<i>Tanacetum parthenium</i> (L.) Sch.Bip.	Altamisa	Blood purification', analgesic, 'stomach acidity', parasites, lesions, cough, rheumatism, inflammations, facilitating delivery, menstruation, sacred, skin: 'granos'	4	0	I	C, R	V
<i>Piper tuerckheimii</i> C.DC.	Kuxtín Q'eheñ		0	4	-	R, F	V
<i>Piper peltatum</i> L.	Yut'it'		0	5	-	C, R, F	V
<i>Pimpinella anisum</i> L.	Anis	Alcoholism, stimulates delivery, contractions, antibiotic, children that cry a lot, arthritis, cramps	3	0	I	-	L
<i>Neurolaena lobata</i> (L.) R.Br. ex Cass.	Tres Puntas, K'a' Mank'		0	4	N	R, F	V
<i>Momordica charantia</i> L.	Sandía de Ratón, Sandiy'cho		0	4	I	C, R	V

Table 2: Medical use classification. Categories are defined as modifications of the WHO's International Statistical Classification of Diseases and Related Health Problems (ICD-10; World Health Organization 2015) . Original chapters annotated behind category name. # UR's [%]: Relative share of total use reports by linguistic group. (N_{UR} , N_T), F_{IC} : Absolute number of UR's, number of genera, and (in bold) consensus factor by category.

	Frequent emic use concepts		# UR's [%]		(N_{UR}, N_T) , F_{IC}	
	Kaqchikel	Q'eqchi'	Kaq.	Q'eq.	Kaq.	Q'eq.
Musculoskeletal System (part. XIII)	Bone fractures, trauma, arthritis, joint problems, osteoporosis, bone ache, 'to increase water in bones & cartilages'	Bone fractures, trauma, swellings, muscular cramps, bone, joint & muscle ache, arthritis, itches in muscles & bones	6	8	(101, 80), 0.21	(63, 43), 0.32
Circulatory System (IX)	Cardiac stimulant, rheumatism, blood pressure, veins & arteries, arteriosclerosis, blood circulation & 'sleeping limbs'	Rheumatism, blood pressure, nose bleeding, 'sleeping limbs'	5	2	(76, 62), 0.19	(19, 17), 0.11
Blood, Immune & Endocrine System (III + IV)	Depurative, anemia, tonics, stimulants, allergies, diabetes & blood sugar, cholesterol, obesity, hormones, immune system & body defenses, coagulation	Anemia, nutritional deficiencies, tonics, allergies, diabetes & blood sugar, coagulation, bleeding	16	6	(261, 169), 0.35	(46, 40), 0.13
Respiratory System (X)	Cough, expectorants, mucus, influenza, colds, bronchus, lungs, pneumonia, asthma, respiratory problems	Cough, influenza, lungs, pneumonia, tuberculosis, asthma	6	5	(89, 67), 0.25	(39, 30), 0.24
Digestive System (XI + part. I)	Stomach, gastritis & gastric cysts & ulcers, digestion, colic, diarrhea, vomiting, parasites, worms, purgatives, liver, hepatitis, pancreas, hernia	Stomach & stomach ache & cramps, digestion, colic, gastritis, gastric cysts & ulcers, constipation, diarrhea, vomiting, parasites, worms, dysentery, cholera, purgatives, throat, hepatitis, hernia	15	13	(241, 161), 0.33	(100, 73), 0.27
Urinary System (part. XIV)	Diuretics, bladder infections, kidney, kidney stones, peeing problems, uric acid, water retention	Urinary infections, peeing problems, kidney, water retention	9	3	(141, 105), 0.26	(21, 15), 0.30
Reproductive System (XV + part. XIV)	Regulation of menstruation & fertility, ovaries, uterus, cysts or ulcers in ovaries & uterus, vaginal 'fluxes' (red or white), prostate, impotence	Regulation of menstruation & fertility, uterus, abortion, pregnancy & giving birth, vaginal 'fluxes' (red or white), prostate	7	11	(106, 82), 0.23	(83, 52), 0.38
General Tissue Problems & Infections (II, XII, part. I + varia)	General inflammations, wounds & wound healing, killing bad cells & tissue, cancer, tumors, leukemia, tissue 'grains', warts etc., ulcers, skin problems, itches, general infections, antibiotics	Wounds & wound healing, ulcers, 'sankh', skin issues, itches, burns, bruises, tissue 'grains', warts etc., colored skin swellings ('mai'), pus, cancer, tumors, general infections, fungi, antibiotics, leishmaniosis, malaria, dengue, insect bites	16	19	(262, 168), 0.36	(142, 88), 0.38
Central Nervous System & Behavioral Syndromes (V)	Painkillers, nervous problems or attacks, sleeplessness, tranquilizer, relaxant, headache, epilepsy, stress, antidepressant	Nervous or mental excitation or attacks, jealousy, craziness, sleeplessness, epilepsy, stroke, headache, shock ('susto', 'espanto')	12	14	(186, 133), 0.29	(109, 63), 0.43
Spiritual Uses (additional)	Sacred, ceremonial use	Black magic, bad spirits	4	3	(59, 42), 0.29	(25, 23), 0.08
Other (additional + varia)	Fever, alcoholism	Fever, sweating, animal bites & poisons	6	15	(91, 67), 0.27	(115, 73), 0.37

Table 1: Full list of species with four or more Use Reports in one and the same class, and its uses in that class.

	Musculoskeletal System
<i>Bursera simaruba</i> (L.) Sarg.	'Golpes' – lesions due to hits, pain in body & bones
	Circulatory System
<i>Cymbopogon citratus</i> (DC.) Stapf	Problems of blood pressure, improve circulation
	Blood, Immune & Endocrine System
<i>Solanum nigrescens</i> M. Martens & Galeotti	'Blood purification & weakness', diabetes, cholesterol, anemia
	Respiratory System
<i>Eucalyptus cinerea</i> F.Muell. ex Benth.	Pulmonary & bronchial problems, influenza, cough, asthma
	Digestive System
<i>Ricinus communis</i> L.	Purgative, parasites, amoebas
<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Stomach ache, parasites, purgative, diarrhea, vomiting
<i>Carica papaya</i> L.	Digestive, stomach infections, parasites, purgative
	Urinary System
<i>Arthrostemma ciliatum</i> Pav. ex D. Don	Pain during urination, urinary infections
	Reproductive System
	none
	General Tissue Problems & Infections
<i>Aloe vera</i> (L.) Burm.f.	Infections, inflammations, wounds, ulcers, tumors, cysts
<i>Blepharidium guatemalense</i> Standl.	Ulcers, 'sankh', leishmaniasis – 'mosca chiclera', antibiotic
<i>Hamelia patens</i> Jacq.	Skin problems: 'granos, ronchas', itching, inflammations, ulcers, leishmaniasis – 'mosca chiclera', tumors
<i>Plantago major</i> L.	Infections, inflammations, wounds, ulcers, cysts, cancer
<i>Semialarium mexicanum</i> (Miers) Mennega	Cancer, ulcers, inflammations, infections, fibromas in uterus and breast, wounds
<i>Rivina humilis</i> L.	Tissue problems: 'nacidos, granos, ronchas', itching, cancer, ulcers, wounds
<i>Struthantus</i> sp.	Antibiotic, inflammations, skin problems: 'mai', 'masas', gastritis, ulcers, cysts, tumors, wounds
	Central Nervous System & Behavioral Syndromes
<i>Erythrina berteroana</i> Urb.	Nervous problems, 'epilepsy', pain, sleeplessness
<i>Tilia platiphyllus</i> Scop.	Relaxant, cramps, 'epilepsy', nerves, analgesic, sleeplessness
<i>Verbena litoralis</i> Kunth	Analgesic, relaxant, 'epilepsy', cramps
	Spiritual Uses
<i>Rosmarinus officinalis</i> L.	Sacred, ceremonial, saturations, 'energy of the blood', black magic
	Other
	none

2.5.5 Ethno-pharmacopoeias reflect societal context

Table 4 provides information on the relative frequency of use for each class (% of total UR's per region). Use classes differentiate into classes of lower ($\leq 9\%$) and higher frequency ($\geq 11\%$). The following uses are frequent in both groups: (1) digestive system, (2) central nervous system and behavioral syndromes, and (3) general tissue problems & infections. Furthermore in the Kaqchikel area (1) the blood, immune & endocrine system is cited frequently, containing frequent references to blood 'purification' ('depurativo', 'limpiador de la sangre'). In the Q'eqchi' area, (1) the reproductive system and (2) the residual category "other" are frequent. This is due to frequent references to (1) conditions relating to menstruation and vaginal discharges and problems of the uterus (e.g. 'partos', 'matriz', 'flujos vaginales'), and (2) to fever and sweating (e.g. 'calentura', 'fiebre', 'sudor'). Spiritual uses are infrequent in both groups. In addition, in the Q'eqchi' area, the circulatory system and the urinary system are rarely mentioned.

Therefore, some of the most common classes of remedies, for the digestive system, the central nervous system and behavioral disorders, and tissue complaints are shared, while each group has other categories with particular prominence. Notably, the digestive system contains many of the communicable diseases traditionally common to societies in developing countries. In contrast, the most prominent difference concerns the categories (1) blood, immune & endocrine system, and (2) circulatory system. These include the majority of chronic, non-communicable diseases (diseases of affluence) like diabetes, obesity, hormonal problems, allergies, syndromes of the immune system, arteriosclerosis, and problems of blood pressure. UR's for these classes are almost three times as common in the Kaqchikel area as in the Q'eqchi' area (21% of UR's as compared to 8%). This reflects the so-called double burden of diseases experienced by many developing countries (Boutayeb 2006), which are unable to control communicable diseases as effectively as developed countries, and yet also have to deal with the non-communicable diseases associated with affluence. This seems more pronounced in the Kaqchikel area, which again coincides with this groups higher and more "developed" standard of living.

2.5.6 Ethno-pharmacopoeias reflect sociocultural history

Table 5 shows a full list of species with four or more UR's within the same use class. However, as the table shows there are very few such examples. This is illustrated more comprehensively in Table 4: the consensus based on the F_{IC} is relatively low in all classes, not a single class exceeds 0.43. Some clearly defined emic categories like diabetes and blood sugar level were tested as alternatives, but showed similarly low consensus. Among almost all classes, there is a very clear relationship between class size and F_{IC} (Figure 2) as known from other studies (Heinrich et al. 1998). Since the majority of UR's refer to various diseases in different classes, increasing sample size by merging categories linearly increases N_{UR} , whereas N_t increases according to limited growth. Therefore, the ones with high F_{IC} despite of small class size are most consensual. In the Kaqchikel area, these are spiritual uses. In the Q'eqchi' area, it is the urinary system. Overall however, a consensus of identifying certain taxa with particular use classes does not seem to exist even at genus level. This adds to the lack of repeated UR's and can be explained in different ways.

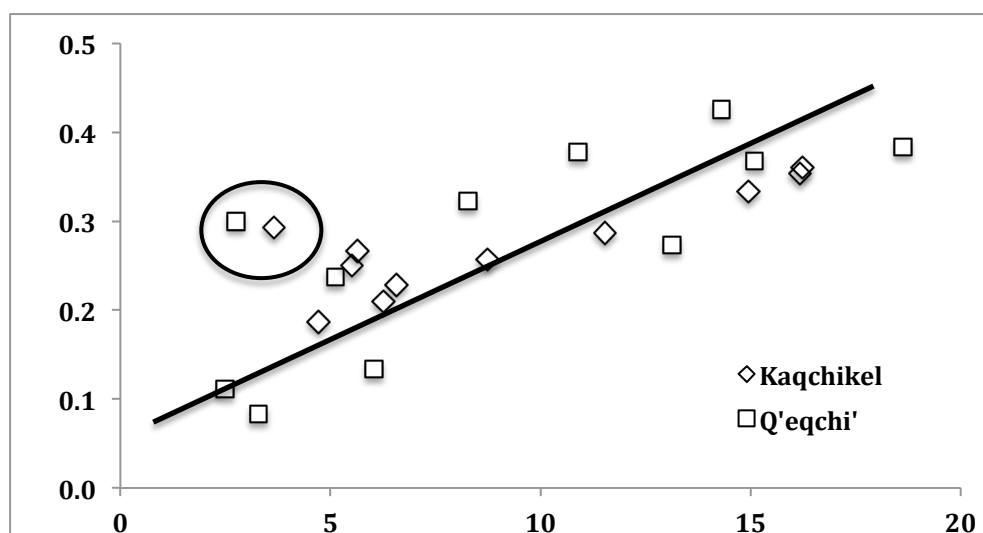


Figure 1: Consensus factors (F_{IC} , y-axis) as a function of relative share of Use Reports (x-axis). Added: a tentative linear relationship between F_{IC} and class size, and categories with relatively high consensus despite of low class size (marked with a circle).

On the one hand, many of the species and UR's from individual healers earned broad support during the validation workshops, without appearing in other healers' free-listings or collections. This suggests some consensus in terms of emically defined categories, the botanical equivalent of which are complexes of medicinal species (Bye and Linares 2015; Linares and Bye 1987). The genera level as applied in the consensus analysis might simply not be the right analytic approach. Also, finding consensus might require scaling-up of the effort due to having accessed random portions of each healer's total knowledge.

On the other hand, knowledge in both groups is likely to be fragmented. This is in part due to the healers living quite far from each other and in slightly different biomes, which introduces a level of natural and cultural variation mostly unknown in ethnobotanical research focusing on single communities (as e.g. in Heinrich et al. 1998). This casts doubt on the use of the F_{IC} in a regional setting covering an ethnic group. During the colonial period, the Catholic Church burnt codified Mayan knowledge. At least in the Kaqchikel area, exchange between the reductions was severely limited, and during the civil war Mayan healers and priests (including many of the healers in our study) were targeted and persecuted for allegedly being communist guerilla leaders. As a result, many networks of communication and exchange were destroyed or forced into hidden societal niches. This is exemplified by the transmission pathways of knowledge, which tend to be a secretive teacher-student relationship. However, in recent years group formats of learning that would allow open exchange have been introduced in the Q'eqchi' area.

2.5.7 Understanding medical change

Field observations have shown that some reported species are introduced from other regions, such as rosemary (*Rosmarinus officinalis* L.): a species from the Mediterranean region that was frequently reported in the Kaqchikel area and collected in open lands. Its history of cultural adoption in Mesoamerica has been discussed in a previous publication (Heinrich et al. 2006). Table 3 presents more examples. Overall, the phytogeographic origin of 289 of the 530 identified species could be established. Of those, 212 are native to

Guatemala, Mesoamerica or Central America, and 77 are introduced from other regions. In the Q'eqchi' area, the phytogeographic origin of 132 (out of 284) species could be established, out of which only 11 are introduced. Importantly, hardly any of the species listed in the Q'eqchi' area are marketed or processed remedies. In the Kaqchikel area, the origin of 176 (out of 324) species could be established, out of which 69 are introduced, and many are rarely found naturalized. Thus, in contrast to the Q'eqchi' area, the medicine in the Kaqchikel area is strongly influenced by knowledge and use of non-native plants.

This can be interpreted as resulting from two different (not mutually exclusive) processes: (1) Differences in numbers or frequency of occurrence of introduced species, or (2) different cultural experiences shaping the adoption of introduced species and their medical uses. Some indication supports the first hypothesis, such as the limited impact the colonial and independent governments had on Petén ecosystems until the 1970's. However, due to the lack of biogeographical data on introduced species, this requires more research.

In contrast, the history of the two groups provides convincing arguments to support the hypothesis of divergent sociocultural opportunities or dispositions for contact with new and introduced knowledge. The Kaqchikeles' language skills and education enable them to use books and other materials to extend their knowledge beyond that transmitted to them by personal Mayan teachers. Their location has historically brought them into much closer contact with the Spanish clerics who cultivated European medicinal plants in convent gardens. Their urban lifestyles mean they now have little access to many native species, while marketed and introduced remedies are easily accessible. Fieldwork insight testifies they do make extensive use of these options. At the same time, the Q'eqch'i were relatively isolated throughout the colonial era. Until the 1970's (when the interviewed healers received the majority of their knowledge and before the advent of modern infrastructure to remote lowland regions) they were living in regions bountiful of primary forest, while access to marketed goods was limited. Until today, language and literacy barriers prevent them from exchanging easily with non-Mayan counterparts or books.

2.6 Conclusion

This study is one of few major collaborative ethnobotanical investigations anywhere in the world and certainly one of the first in Central America. For the first time, the objectives, research design and sampling strategy were developed jointly between informants and investigators, and some of the project steering and fieldwork were conducted together. Furthermore, the research question and the methodology aimed both at documenting and strengthening medical practice. It, therefore, is an example of north-south cooperation using TD. Despite practical limitations in the difficult context of Guatemalan society, advantages include the facilitation of contacts and networks, legitimacy of the research, building of trust and capacity, and empowerment. It thus enables scientifically rigorous and societally relevant fieldwork and provides evidence for a TD methodology being an important enabler in facilitating the collection of comparative data in a geographical and cultural space, the breadth of which has rarely been reached in individual projects.

As the first major investigation of medicinal plants in of Guatemala, it greatly extends knowledge of the ethnic pharmacopoeias. Contrary to many studies it uses a comparative approach to investigate the medicinal plant use of two indigenous groups. Although not complete, it represents the knowledge of the group's most reputed phyto-therapeutic healers and, it is a representative selection of the Guatemalan medicinal flora (with

specific, well-defined exceptions to be complemented in future investigations). Whilst very few ethnobotanical studies have so far critically reflected upon the strategies of informant selection as part of the research process, our TD approach has fostered the mutual recognition of such a selection by the Councils of Elders and the researchers, and this paper is novel in highlighting this step as crucial for the representativeness of results.

The application of the ICD-10 in structuring the knowledge was a pragmatic approach to providing a robust general overview. However, it also demonstrates the lack of any one-fits-all solution for cultural comparisons. The starting point for further analyses would be the development of a classification system tailored to the pertinent research objectives.

The two ethno-pharmacopoeias are remarkably diverse. Whilst more detailed studies might reveal greater consensus than we could discern, the differences may be real and reflect historical and biogeographic factors. An additional level of fragmentation or relative reduction of knowledge due to the migratory history of Q'eqchi' healers was not observed. Overcoming that fragmentation for a re-systematization of traditional knowledge is one motivation for the Mayan councils to support this research, but new approaches are required to assess how coherent Mayan phyto-therapy really is.

An important motivation for the Mayan Councils of Elders to participate in the study was to document their ancient knowledge and prevent it from disappearing. However, our results provide evidence that the pharmacopoeia of the Kaqchikel area has changed considerably in response to external conditions and new medical challenges. This finding demonstrates the adaptive potential of phyto-therapy and suggests that, in a rapidly changing world, indigenous pharmacopoeias cannot be equated with 'traditional' medicine. Indeed, it seems appropriate to classify plant use as operationally adaptive strategies, which are integrated into more stable elements of medical thought and practice, as evidenced in ETH's wider project on Mayan medicine (Ivic de Monterroso 2016). In this sense, the results are an empirical confirmation of postulated hierarchies of cultural significance (Rappaport 1979). Overall, this study reinforces the perspective that it would be better to use the term 'local' phyto-therapies, and to reserve the term 'traditional' for the study of those indigenous pharmacopoeias where the methodology allows a clear delineation of ancient knowledge.

3. Phyto-therapy in Mayan worldview

Original publication: Hitziger M, Ochaíta-Santizo D, Berger-Gonzalez M (2016): *Q'ayis ajq'om chin utz qak'aslemal : Fitoterapia Maya en Guatemala*. In Consejo Maya de Guías Espirituales y Médicos de Nacimiento (Eds.): *Raxnaq'il Nuk'aslemal: Medicina Maya'ob' en Guatemala*, pp. 206-238. Editorial Cholsamaj, Guatemala C. A.

Preface

This chapter on Mayan phyto-therapy is part of a book publication on Maya medical knowledge in easily intelligible Spanish for a Maya audience in Guatemala (Consejo Mayor de Médicos Maya'ob' por Nacimiento 2016). It introduces historical investigations of medicinal plant use in Mesoamerica, and adds to this presented research by illustrating emic concepts of material and spiritual aspects in Mayan phyto-therapy. Specific foci are material aspects of plant preparation and application, as well as spiritual concepts on the plants form of being, the healer's mission as phyto-therapeutic practitioners, and Mayan concepts of healing through interactions between healers, plants and the universe. Therefore, this chapter is complementary to chapter 2. The spiritual concepts touched upon in this chapter are much more comprehensively elaborated in other parts of that book.

Most of the chapter is based on original quotes of healers, which were carefully selected from the first project phase (Berger-Gonzalez et al. 2016), as well as research presented in other chapters. All healers agreed to use their names to identify quotes. When there were no appropriate quotes, original data was summarized, aiming at preserving emic depth and representativeness. The content was validated by a Maya editorial board, consisting of three members of the Kaqchikel, Q'eqchi' and K'iche Councils of Elders, who repeatedly revised, modified and changed the synthesis in order to ascertain emic depth and representativeness. Thus, this synthesis represents emic concepts held by contemporary Mayan phyto-therapeutic specialists.

The present chapter presents a modified version of this book chapters' main text. It was translated and restructured by the main author to better fit the audience. Most of the pictorial illustrations, text boxes in Maya languages, and some sections covered in chapter 1 were excluded. Local species names were complemented by botanical nomenclature. A conclusion was added.

3.1 Introduction: Research on medicinal plants in Mesoamerica

In colonial times in Mesoamerica, the Spanish were interested in indigenous medications. This stipulated detailed chronicles about medicinal plants, their botanical diversity, and their phyto-therapeutic uses. In México, some were very extensive, such as the one compiled in seven books by the medical doctor Francisco Hernández (Hernández 1959) who served the Spanish King Philipp II. This king sent him to examine and describe the classes and forms of plants, animals and minerals in México. His compilation presents each plant with their physiognomy, sometimes alongside illustrations that were made by indigenous Aztecs that accompanied Hernández. It also included their preparations and uses, and botanical data. In total, it lists 990 plant species, whose uses date back to colonial and pre-colonial times. Another colonial chronicle was ordered by Antonio de Mendoza, and with the help of Franciscan monks, medicinal plant uses of 227 plant species in the Nahua area of México were compiled in 1550 (Gates 2000). For 64, only names are recorded, while 185 are illustrated by a Mexica artist and scribe. This effort was realized by Fray Jacobo de Grado and Martin de la Cruz, a baptized Mexica healer and is known as the '*Codex Cruz-Badiano*'.

In the Mayan area, the most extensive chronicles refer to the Yucatan peninsula, where several manuscripts from the 16th to the 18th century survive. One example is a compilation of 68 texts on exorcisms, prayers and medical recipes. It is known as the '*Ritual of the Bacabs*', which was redacted in the 17th century, but certainly contains pre-colonial information (Arzápalo 1987). This text presents hardly any European influences, and concentrates on describing medical, magic, religious and botanical concepts. The text's structure is relevant, since it describes distinct illnesses alongside their diagnosis and therapy according to the Yukatek medical system, the four cardinal directions and deities. Other documents of the area, such as the '*Manuscritos de Sotuta y de Mena*' and the various books of '*Chilam Balam*' are sources of Yukatec medicine (Barrera-Vasquez 1987). Specifically, the book '*Chilam Balam of the Ixil*' contains 66 recipes in Mayan language. In the 19th century, Juan Pío Pérez and Hermann Berendt published recipes from various sources in their book '*Recetarios de Indios en Lengua Maya*' (Barrera-Vasquez 1987). Another one of the first scientific investigations of Mayan phyto-therapy was published by (Roys 1931), in which he systematized phyto-therapeutic knowledge from Yucatán. This information was recorded in Mayan languages and compiled sources from colonial times. Soon after, first empirical studies were supported by state institutions, first conducted by (Martínez 1990) and then more systematically by other researchers such as (Berlin & Berlin 1996), which until now have resulted in a national inventory of medicinal plants of several thousand species in all of México (Villamar et al. 1994). Furthermore, in Belize there exist some compilations that resulted from collaborative efforts of western scientists and representatives of Mayan culture (Balick & Arvigo 2015; Pesek et al. 2010).

In Guatemala, few efforts on Mayan medicinal plants were published internationally, for example (Kufer et al. 2005; Michel et al. 2007). The '*Vademecum Nacional de Plantas Medicinales*' contains about 100 species used in traditional medicine, which explanations of their medical functions, backed up with scientific studies (Cáceres 2009). There also exist various theses and departmental collections, which are accessible locally and often contain only superficial or invalid information. Therefore, little is known about contemporary phyto-therapeutic knowledge of Mayan healers in Guatemala, and even less so from emic viewpoints. The following sections present a synthesis of phyto-therapy in Mayan worldview, structured into material and spiritual aspects.

3.2 Material aspects of Mayan phyto-therapy

3.2.1 Preparation and application of medicinal plants

There are diverse forms of preparing and using medicinal plants. In general, the following forms can be distinguished.

- a. Fresh plants for consumption: This refers to plants that have to be consumed in fresh form. Examples are *Ajo* (*Allium sativum* L.) for high blood pressure, *Sábila* (*Aloe vera* (L.) Burm.f.) for digestive problems, *Rábano* (*Raphanus raphanistrum* subsp. *sativus* (L.) Domin) to purify the blood, or *Chili* (*Capsicum annuum* L.) to treat gastric ulcers.
- b. Dried plants for consumption: These plants are dried and can be stored for extensive periods before consumption. These may be chewed, directly swallowed, or consumed in the form of powder and capsules. Examples are *Fenogreco* (*Trigonella foenum-graecum* L.) for internal infections such as stomach ulcers or uterine infections. Other examples are *Cola de caballo* (*Equisetum hyemale* L.), *Zarzaparilla* (*Smilax domingensis* Willd.), *Hierba de cancer* (*Acalypha aristata* Kunth), *Palo de pito* (*Erythrina berteroana* Urb.), mixed with lemon juice (*Citrus aurantiifolia* (Christm.) Swingle), which are prescribed by Simeón Taquirá [Kaqchikel] for oral hygiene.
- c. Boiled plants for consumption: The preparation of these plants is in liquid form and requires heat to release their medical function. In some cases, they need to be toasted and boiled afterwards, as in the recipe given by Valentina Barrero [Kaqchikel] in case of malign illnesses like ulcers or cysts: *One takes Apasote* (*Dysphania ambrosioides* (L.) Mosyakin & Clemants), *Apacín* (*Chenopodium murale* L.), *Hierba de cancer*, *Zarzaparilla*, *Cola de caballo*. *Afterwards they are toasted and boiled and then given to patients to drink. After three months they are healed.* In other occasions, the plants are directly boiled over the fire to prepare an infusion, or they are put into hot water to prepare a tea, which is called *apagado*. These recipes usually have to be consumed rapidly, to not lose their function.
- d. Tinctures for consumption: These preparations are used for preserving plants that are not available at any time, or for patients who do not have the possibilities to constantly preparing medications freshly. The plants are washed, put into solutions of water and alcohol for extended times (up to several months), which have to be stirred periodically. The tinctures are bottled and prescribed in particular doses, such as by spoon or drop. In other cases, honey is used for children's tinctures, such as in the case of Juan Yaxcal [Q'eqchi'], who produces extracts from 13 *Bougainvillea* (*Bougainvillea glabra* Choisy) varieties and preserves it in honey to treat bronchial infections.
- e. Preparations for topical application: Some plants are directly applied in the skin or affected areas of the body. They are used in the form of cold or hot compresses, usually for infections. Other plants are heated in the fire or toasted. An example is the healer Modesta Pérez Ramos [Mam] who prepares the *May* (false tobacco, not identified) by heating it over the fire and then rubs it on the abdomen of pregnant women who suffer from "*aire*".
- f. Steam and baths: Some healers prescribe plants in an application that boils them in a covered pot, which is carried to the sleeping room and opened, such that the steam penetrates into the sexual organs of the patients. This is different from seat baths, in which the patient directly sits in the warm liquid. In other cases baths of the complete body are prescribed. For example, for a patient with persistent cough,

Yuan Yaxcal [Q'eqchi'] prescribed 2 different baths. The first recipe (*Piper sp.*) was used once to provoke severe sweating to drive out the coldness that had entered the patient's body, to the degree that clothes were completely soaked in sweat. The second recipe contained two varieties of *Lok'ab* (*Critonia campechensis* (B.L.Rob.) R.M.King & H.Rob. mixed with *Ageratum corymbosum* (Zuccagni ex Pers.)) and was used 3 times in subsequent days to release the cough. Each preparation contained about 4-5 liters of boiled liquid. Half a liter was to be drunk, the rest was applied as a shower-bath from hair to toenails and then rubbed into the patient's skin during sunrise. The patient was healed after five days. Other plants are applied in *temascal, tuj or chuj* [steam baths] such that the patient absorbs and inhales the steam with each pore of his body. The preparation includes a pot with boiled plants inside the steam bath, which is poured drop by drop over hot stones such that it evaporates. The plant substances and the heat clean the body and are considered detoxicating. Some healers use the steam bath before starting any other medical treatment to cleanse the patient, such that nothing shall contaminate the Mayan treatment.

- g. Smoke: A final form of application is to burn the plant such that the patient is enveloped in smoke. For example, smoking cigars or false tobacco and blow the smoke over the patient such that it forms a cross on the four sides of its body removes negative energies.

However, many healers have specific protocols that go beyond these general modes of preparations and applications. Complexity further increases, since some treatments use various plants in several medications, as shown in the next section.

3.2.2 Complexity of Mayan phyto-therapies: a case description

To illustrate the complexity of some Mayan phyto-therapies, we present a case study of treating an Itzel Yab'il [Kaqchikel: a malign disease of spiritual origin] that was recorded by Luis Morales [Kaqchikel].

"Maria Simat¹, 44 years old was diagnosed with cancer in both breasts and the uterus. Several chemotherapy sessions in private clinics were unsuccessful. Therefore, the doctors recommended a high-risk surgery, which was pending when the patient visited me. When I saw her, she was pale and hopeless. She had partially lost her hair, her fingernails were fragile, she intermittently had high fever, her breasts were extremely inflamed, of red to violet color and elevated temperatures up to her throat.

I tried to give her confidence and analyzed and compared the different lab tests. With this basic information, I concluded that it was a disease of natural origin. Afterwards, I spiritually consulted with whether there possibilities to help her physically or spiritually, and to make sure there were no other causes of her illness. The results were that it was a complex and severe natural diseases, with little probability of recuperation.

I confirmed her that the illness was severe and complex, that she should have trust with the Ajaw, that her situation would be resolved within a medium time frame and that there was a need to act immediately, using natural medications, sexual abstinence, a diet, activities for diversion and against depression, and meditation in accordance with her own belief system.

Before starting the phyto-therapeutic treatment, I conducted a fire ceremony to spiritually assist her and at the same time to strengthen the plants that were applied in the

¹ Name was changed to protect the patient's confidentiality

medications. In the ceremony, I used petals of white flowers, Pom [dried sap of tree barks] Ensartes [incense made from wood and tree barks], Pericón (*Tagetes lucida* Cav.), Romero (*Rosmarinus officinalis* L.), Menta (*Hyptis* sp.), Maria Luisa (*Aloysia citriodora* Palau), and white candles of wax and animal fat. Afterwards I prescribed the following medications:

- a. Drainage therapy: Boiled Hierba mora negra (*Solanum nigrescens* M. Martens & Galeotti) in a cup of water, afterwards cooled down, stirred, sieved and mixed with magnesium powder, stirred well and drunk it in a single gulp. One cup once a week.
- b. Organic detoxication therapy: An infusion of depuratives: Abedul rojo (*Alnus acuminata* sbsp. *arguta* (Schltdl.) Furlow), Bardana (*Illicium verum* Hook.f.), Milenrama (*Achillea millefolium* L.), Muérdago (*Struthanthus* sp.), Cordoncillo (*Piper uhdei* C.DC.), Ortiga (*Urtica urens* L.), Salvia sija (*Lippia alba* (Mill.) N.E.Br. ex Britton & P.Wilson), Hinojo (*Foeniculum vulgare* Mill.), Vincapervinca (*Vinca major* L.), Boldo (*Peumus boldus* Mol.), Fenugreek (*Trigonella foenum-graecum* L.), Cancerina (*Semialarium mexicanum* (Miers) Menega), Hierba de cancer (*Acalypha aristata* Kunth), Hipérico (*Hypericum epigeium* Keller), Pericón, Sauco (*Sambucus canadensis* L.), Margarita Silvestre (*Erigeron karvinskianus* DC.), Cardo pinto (*Silybum marianum* (L.) Gaertn.), two varieties of Verbena (*Verbena litoralis* Kunth).
- c. An infusion of diuretics: Pelo de Maiz (*Zea mays* L.), Pimienta de agua (*Persicaria glabra* (Willd.) M.Gómez), Cola de caballo (*Equisetum hyemale* L.), Taray (*Eysenhardtia adenostylis* Baill.), Chichipate (*Urera elata* (Sw.) Griseb.).
- d. To stimulate the immune system: An infusion of Apacín (*Chenopodium murale* L.), Borraja (*Borago officinalis* L.), Chilca (*Senecio salignus* DC.), Palo de Jiote (*Bursera simaruba* (L.) Sarg.), rattle snake powder, bee powder.
- e. To heal the inflammation: Hot compresses with Chocom (*Wigandia urens* (Ruiz & Pav.) Kunth), Apasote (*Dysphania ambrosioides* (L.) Mosyakin & Clemants), Roble (*Quercus crassifolia* Bonpl.), Fenugreek, Mostaza (*Brassica rapa* L.). Cold compresses with Aloe Vera (*Aloe vera* (L.) Burm.f.) and water ice. To be applied alternately.
- f. Diet: One cup of lemon juice without sugar (*Citrus aurantiifolia* (Christm.) Swingle) every morning.

After 14 days of treatment, the patient appeared slim but with a good appearance of the skin. The pain and the heat in the breasts had diminished, the color of the skin was normal. In the lower part of the breasts, small nodules appeared, about to break open, and the pain in the uterus had ceded. After 56 days of continuous therapy, the symptoms had disappeared. To check, the patient again went to the private clinic. According to their exams, the tumor in the uterus had remained stable and even reduced, but there remained necrotic tissue, which was removed in a lower risk operation. Currently [ca. 10 years onwards] Maria Simat is working and enjoys good health.”

This report demonstrates the complexity that a Mayan phyto-therapeutic intervention can have, since it not only is aiming at the apparent symptoms, but also holistically strengthens the patients’ spirit and physiology. In this case, 36 plant species and additional ingredients were applied in different preparations, a ceremony was conducted, and lifestyle and dietary changes were prescribed.

3.3 Spiritual aspects of Mayan phyto-therapy

The Ruk'u'x Ulew [Heart of the Earth] is our food, our everyday staple, it is the medicinal plant the we use to alleviate illnesses. In its surface we find all species that are able to alleviate illnesses that affect the health of the human being. Therefore, in the heart of the earth we find the strength of our blood, and our body, through the diet and the medicinal plants that it provides us with (Isidro Valle, Mopán).

3.3.1 Medicinal plants: Our elder siblings

The relation of Mayan communities with medicinal plants is integral to their worldview. The knowledge of any medicinal plant species is linked to Mayan concepts of existing in harmony and respect with Mother Earth and everything that dwells on her. All plants, as well as animals are considered elder brothers of man, since they were created before us.

They [the creator spirits] were enlightened during their meditation: upon sunrise, mankind was to be created. Therefore, they ordered the creation of trees and lianas, the commencement of life, and the creation of man (Popol Vuj, Recinos 2008).

Animals and plants have to be respected, because they were created before man. They are our larger brothers. One form of thanking everything that exists in life is a sacred ceremony. When people do not give the plants and animals the respect they deserve, they will fall ill, since they are our larger brothers, they are alive. When one fells a tree one has to ask for permission, likewise when killing an animal. Mayan spirituality must not be forgotten, because it enables the communication and the appreciation of all beings with the creator of the sky and the earth (Council of K'iche Elders).

This implies that one has to appreciate, accept and honor everything that exists, to allow the harmonious co-existence with our surroundings. This external harmony is complemented by internal harmony.

The rules that were given by our spirits are to have respect the sacred mountains, the sacred valleys, the sacred fish, the sacred lianas, the sacred medicinal plants. To all them we have to keep respect, so that they shall be source of our energy and diet (Francisco Caal, Q'eqchi').

The characteristics of medicinal plants in Mayan worldview are the same as of any other living being. According to Mayan healers, plants have characteristics of humans, such as

- a. the ability to sleep and wake up, and to communicate with human beings: *One has to move ones hand over the plant before eating it. This is the form to connect with it, our ancestors also talked to medicinal plants. One has to wake them up during the day, because they are sleeping (Carlos Zavala, K'iche),*
- b. the ability to breath: *Everything that exists is important, because the sky, and the earth produce a force and an energy. If neither sun nor heat existed, we could not talk about diet. If air did not exist, there would be no life. We are aware of the plants, but we do not see that they have a nose. Nevertheless, they breathe (Luis Morales, Kaqchikel),*
- c. the possession of an own spirit, *Rajawal [Kaqchikel] or Musiq [Q'eqchi']*: *Our Mother Earth, the animals, are alive, because they were created by our Ajaw [Lord spirit]. We have the obligation to respect and value everything that exists in the universe, the medicinal plants have a spirit because they heal illnesses (Julián Loch, Kaqchikel),*
- d. and the ability of sense: *We, all healers, know the prayers or specific enchantments for an illness or to enter dialogues with medicinal plants, so that they understand us and*

feel. These enchantments we guard within ourselves, we learned them from our teachers (Andrés Coc, Q'eqchi').

The need to converse with the plants, to bless and to strengthen them in specific enchantments is frequently mentioned. This makes sure that the relation will be fruitful, and secures successful treatments. The plants are sacred, since they come from Mother Earth. They allow us to reconnect with nature and to return its harmony.

These beings have their own function, and for each of them I pronounce their name in each treatment. For example, the sacred hills and valleys, the sacred lianas, the sacred rocks. From these living beings comes the force that nourishes and strengthens the body of the patient. This happens, since these beings are completely healthy, clean, nothing can spoil them, therefore they remain clean at any time. They remain attentive and prepared to help us at any moment (Lorenzo Choc, Q'eqchi').

Nature is our mother, from her we nourish ourselves. If the sacred chill did not exist, we would die, without the sun and the warmth we die, without night we cannot recover, without oxygen there is no life. Water has a heart, as well as the plants that heal us, the elements that provide cure, but all of this belongs to the Creator. The energy that we have in our body comes from different elements, and all together they provide equilibrium (Josefa Vicente Caniz, K'iche).

Thus, an essential aspect of Mayan medicine is the concept of plants as loving elder siblings, prepared to help us in moments of pain and illness. Their sacred and pristine equilibrium can assist us in moments of disequilibrium that causes illness.

3.3.2 Mayan healers: strengthening the relations between plants, patients and the universe

The use of plants for the physical and spiritual treatment of a multitude of illnesses is one of the most important practices on Mayan medicine. The healers knowing and guarding great numbers of plant species are called *Ajq'omanel* [Kaqchikel] or *Aj ilonel* [Q'eqchi']. Nevertheless, almost all Mayan healing specializations use plants in their therapies.

I know the uses of 900 species, each of their preparations, in the order in which they will be given to the patient depending on his illness. I keep them planted in a natural reserve in which we are 20 people to protect them. I searched them, one by one and brought them there to plant them (Francisco Caal, Q'eqchi').

Every healer, due to his birth signs has special gifts that allow his spiritual and energetic relation to plants. Their knowledge originates from oral transmission, and also from this capacity of entering into spiritual and physical relations with plants.

*Our knowledge of medicinal plants originated in the hands of our ancestors, since every time that someone fell ill, they immediately started to heal them with plants, which they had at hand. They tried them one by one, and every time they asked themselves: "How is it possible to stop this fever? How could this illness disappear?" They put a first treatment. If there was no effect, they went on with the second. That is how they started to heal themselves. The other part was that every time someone was bitten by a snake immediately everyone came running to the patient, everyone shared his opinion which plant to select. This is how our specialization as *Aj ilonel* developed, those who cure by means of medicinal plants (Francisco Caal, Q'eqchi').*

It was Ajaw, who illuminated the mind of man. When I received my spiritual guidance, these were the words that I was indicated: "here is the sacred plant, that we inherited from

the Creator, to use it as his children, with this plant we will have the capacity to alleviate the pain and the bad smell of an illness. Therefore, the medicinal plants that we have at our disposition, are blessed by the Creator, such that we can use them in case of emergencies." These were the words I received from my spiritual guides (María Roberta Batz, K'iche).

When I finished my education, it was necessary to conduct a sacred ceremony in which my teacher offered spiritual nourishment in my name and in the name of the sacred plants, to make sure that the knowledge of using them shall always remain with me, and that their application shall be effective. If one does not do this sacred act, a healer can lose his knowledge of how to apply medicinal plants (Manuel Chumil, K'iche).

In an extreme form, Francisca Salazar [Kaqchikel] commented that she never had any human mentors who taught her how to use plants or how to practice phyto-therapy. Instead she receives these lessons in direct communication from the spirit world, which can take various forms. Thus, the education of Mayan healers is guided by human or spiritual mentors. Upon receiving their education, the healers commit to wisely apply their skills throughout their life. Independently of the manner in which a healer conducts his work with medicinal plants, his relation with them is permanent both physically and spiritually. Therefore, the process of acquiring knowledge is long and results in a very deep knowledge, since it is often not sufficient to simply apply a single plant for any given illnesses. To receive the information which plant is required for a patient, every Mayan healer needs to stay in good connection with the creator.

First, we consult Ajaw to learn which plant to use for an illness. We do not invent the medications given to our patients, it is the decision of Ajaw (Francisca Salazar, Kaqchikel).

One important characteristic of entering a relation with plants is that they need to be treated as sacred, since they are realizations of cosmic energy. Therefore, even though the order activities may vary among the healers, using them not only requires harvest and application, but also requires blessings and enchantments in specific moments. First of all, one asks the Creator for permission to select a plant.

Plants are alive as we persons are. Except that they do not speak, which makes the difference. Therefore, the first thing we do is to ask permission for cutting down a tree (...). I ask during daylight, I ask Ajaw, since he is the lord of all things. I ask him to give me permission to find and cut the plants every day and at any time, according to the needs of my patients (Juana Chuy, Kaqchikel).

To use the plants, one always has to ask permission from the Creator and from the plant itself, to make sure it will cure effectively. At any time one has to believe in the plants, since this is what our ancestors did to heal themselves (Carlos Zavala, K'iche).

In the moment of finding a plant, one asks for blessing, so that it shall be effective with all its properties to heal the patient. Following to the blessing of the plant, some healers proceed with a blessing or spiritual invocation before mixing the medication that they will give to the patient. Some healers also indicate to pray that the medicine be effective while the patient is taking it.

First one asks permission from Itzamnaj, who is the guardian of the sacred medication, afterwards from the four cardinal directions of the sky, and finally from the spirits Ixmukane, Ixpiyakok, Ixkik', and Ixchel, which were great healers of old times (Simeón Taquirá, Kaqchikel).

I obtain the medicinal plants in the sacred hills and valleys. Once I have them in my hands, or at my disposition, I bless them by invoking the names of our spirits (Rafael Baquí, Q'eqchi').

Before boiling the plant, the first thing I do is an invocation, when I serve the medication in a cup, I bless it before giving it to the patient. With this I guarantee the strength, and power imminent in the medication (Mauro Chub, Q'eqchi').

Frequently, the plants are blessed in a *Kotz'ij'* [Kaqchikel: Mayan fire ceremony]. The sacred fire is used to clarify the material function of plants in the cases of patients with specific illnesses, in the sense that the plants “present” themselves in the ceremony as useful or useless to heal a certain medico-spiritual problem.

What I do is to move the plants over the sacred fire. I do this, so that they acquire strength, since they receive blessings by their lords, our ancestor spirits. Therefore, I only apply them a single time, which is sufficient (Juan Yaxcal, Q'eqchi').

In all my patients I conduct a profound analysis of their illness, as in the case of one of my patients (...). In this moment, I had not yet sown the plant in my garden, therefore I went to the sacred mountains and valleys to find it. Afterwards I prepared it, before drinking it. What I consider important is to have a fire ceremony in the sacred hills, to ask that two forces and two healing powers shall unite: the medicinal plants through their natural effect, and the spiritual power of the sacred hills and valleys. This act is very solemn to me, since it guarantees the effectiveness of the plant and thus the alleviation of the patient. The most preferred place to conduct such a ceremony is the foot of a Ceiba tree (Ceiba sp.), and to the sacred Ceiba I speak (...) since this provides strength and energy (Francisco Caal, Q'eqchi').

The use of plants in fire ceremonies is key for several ends. Among them is their use in diagnosis, in the phase of cleansing the energy field of the patient, when using the plants as intermediaries in communicating with the spirit world, in the different phases of treatment, in strengthening the belief of the patient, in the improvement or recuperation of social relations, when making a *Toj* [Kaqchikel: spiritual offering], or in ceremonies of appreciation after a successful healing.

First thing one does is to use Pom [to burn dried sap of tree barks, obtained in forests at high elevations that are deemed in contact with strong and positive cosmic energies]. With this, one blesses the plant in the sacred fire, and afterwards one prepares the medication. By this means, it becomes much stronger and the patient gains trust (Eduardo Cirilo, Mam).

In the Kaqchikel area, one carefully selects plants depending of the objective of the sacred ceremony. For example, for baptism ceremonies, one usually places specific aromatic plants with honey. These gifts accompany the rest of the offering, which also includes two blocks of *Panela* [raw sugar], one for the spiritual and one for the material dimensions of the living being, and other sweet substances. This symbolizes that there shall be sweetness, harmony, and strength for the child. The baptized child is carried close to the fire four times. This part of the ceremony is called *Wojb'aj*, a process in which the child inhales the aromatic plants, which contributes to a spiritual cleansing, and to avoid illnesses. Plants, whose function is to treat illnesses *Utz yab'il* [Kaqchikel: benign disease of natural origin and generally considered less severe] are believed to cure by physical or material effects, as for example *Eucalipto* (*Eucalyptus cinerea* F.Muell. ex Benth.) for treating pulmonary complaints or *Pericón* (*Tagetes lucida* Cav.) for alleviating stomach issues.

In very delicate ceremonies, like the healing of an *Itzel Yab'il* [Kaqchikel: Malign disease], one asks the Lord Creator for permission to negotiate and eliminate the illness which was provoked by one of the Lords of *Xib'alb'a'* [the Mayan underworld, as it appears in the *Popol Vuj*] and that the patient be freed from the illness. In this case, the composition of plants changes since their spiritual and energetic properties have to be taken into account,

as in the case of *Chilca* (*Senecio salignus* DC.), which is considered to contain strong energetic properties repelling energies related to the underworld².

There is one plant that is used in ceremonies to heal the sick, it works like sweeping waste or washing clothes. Chilca (Senecio salignus DC.) is used to for any illness or problem, to cleanse spiritually (Cirila Romero, Mam).

However, any single plant might belong to both categories. For example, Francisca Salazar uses *Moringa* (*Moringa oleifera* Lam.) for its physical effects of alleviating pain, and lowering the blood sugar level, in mixtures with other plants also as an antibiotic, for wound healing and to reduce inflammation. Accompanied by special spiritual interventions, she however uses the same plant to provoke inflammation. This was exemplified in the case of one patient who had recently undergone an operation to ligate the fallopian tubes to avoid further pregnancies, had however changed her mind. In order to avoid the implications of another operation Francisca Salazar used *Moringa* and spiritual interventions to inflame the fallopian tubes, such that they swell tear off the ligation and allow further pregnancies.

As Francisca Salazar [Kaqchikel] explains, she blesses the plants in different ways. One has to establish an energetic connection between the plants, the energies of the Mayan healer, and the energies of the universe, such that the plants can transfer part of this energy to the sick body of the patient. To establish such a connection, she lights candles, smokes cigars, or burns *Pom*, among other practices. Similarly, other healers explain that the intention is not to receive energy for themselves, but to send energy to establish a connection between the plants and the universe. The key idea is to change the energy of the patient through the plants, by means of establishing a connection between the energies of the cosmos, the energies of the healer, and of the plants, forming an energetic triad.

I use the powerful plants constantly. I diagnose by means of the blood. If necessary, I offer spiritual nourishment to the plants and the patients, and also may ask them to hold a Mayan ceremony (Juan Cac, Q'eqchi').

3.3.3 Relations with the universe: geomorphological exposition, lunar cycles, and the sacred calendar *Cholq'ij*

As mentioned, each plant has its own guardian spirit, called *Rajawal* in the Kaqchikel and Q'eqchi' areas. The healers have the ability to influence these energies jointly with cosmic energies to fight physical and spiritual illnesses. According to Ingleberto Robles Tello [K'iche], the human spirit is perceived as a very low frequency of vibrations, while the *Nawales* [spirits] that have strong energies have very high frequencies. Even though there exist various techniques to change energetic relations, the unifying concept of these practices is explained as invocation of energies of high frequency, which are reflected in plants. The concept of the energetic properties of plants depending on influences from the universe is reflected in several aspects of their medical use, such as their geomorphological exposition, lunar cycles, and the Mayan calendar.

The geographical site in which the plants grow is of high importance, since it determines the energies or characteristics that this plant has to heal illnesses. For example, plants that grow in ravines are used to treat provoked illnesses. On the other hand, plants growing below a *Ceiba* tree (*Ceiba* sp.), in a ceremonial site, or on hills and mountain peaks are

² In chapter 2 and in the appendix, plants which are ascribed special spiritual-energetic properties are listed in the use category „spiritual-energetic uses“.

sought for energetic properties “inhaled” through their proximity to the cosmic skies. These plants are for example used in special medications to help a mother of a newborn child to produce milk for her baby.

In the sky, on mountaintops, plants are growing that contain energy of the sky, of the stars, of the universe. Plants that grow in ravines, have more energy of Xib'alb'a, and thus are particularly useful to fight illnesses of the Itzel Yab'il class, which are caused by the lords of the underworld Xib'alb'a (Luis Morales, Kaqchikel).

Almost all healers mention the moon for determining the times to harvest plants.

In our worldview, we direct our vision to the sky to observe the moon, to see in which phase it is, and when we may obtain medicinal plants (...). The moon has meaning and a function. Like an Iyom [Kaqchikel: midwife] that orients herself by the lunar cycles, the moon influences our life. On earth, there exists a time for sowing, and there exists a time for harvesting. Therefore, the moon is fundamental (Julián Loch, Kaqchikel).

If we want a medicinal plant to be effective, we have to cut it at full moon or growing moon. We do not cut it just at anytime (...). In certain cases, when cutting plants during new moon, it is likely that the patient will not be healed since the plant does not have its medical properties, or has very little energy (Simeón Taquirá, Kaqchikel).

At full moon, I harvest the plants and dry them. That's how they will have more properties when using them (Etelberta Kej, Mam).

The application of elements derived from the sacred calendar *Cholq'ij* is reflected in medications consisting of 3, 4, 7, 8, 9, 13 or 20 ingredients: numbers, which are considered sacred in Mayan numerology. Simeón Taquirá explains that female healers use mixtures of 3, 7, 9 or 13 plants due to their spiritual mission, while male healers use 4, 8, 13 or 20 plants. For example, female healers use mixtures of 9 plants to represent the cycle of human gestation, since it symbolized the capability of giving life.

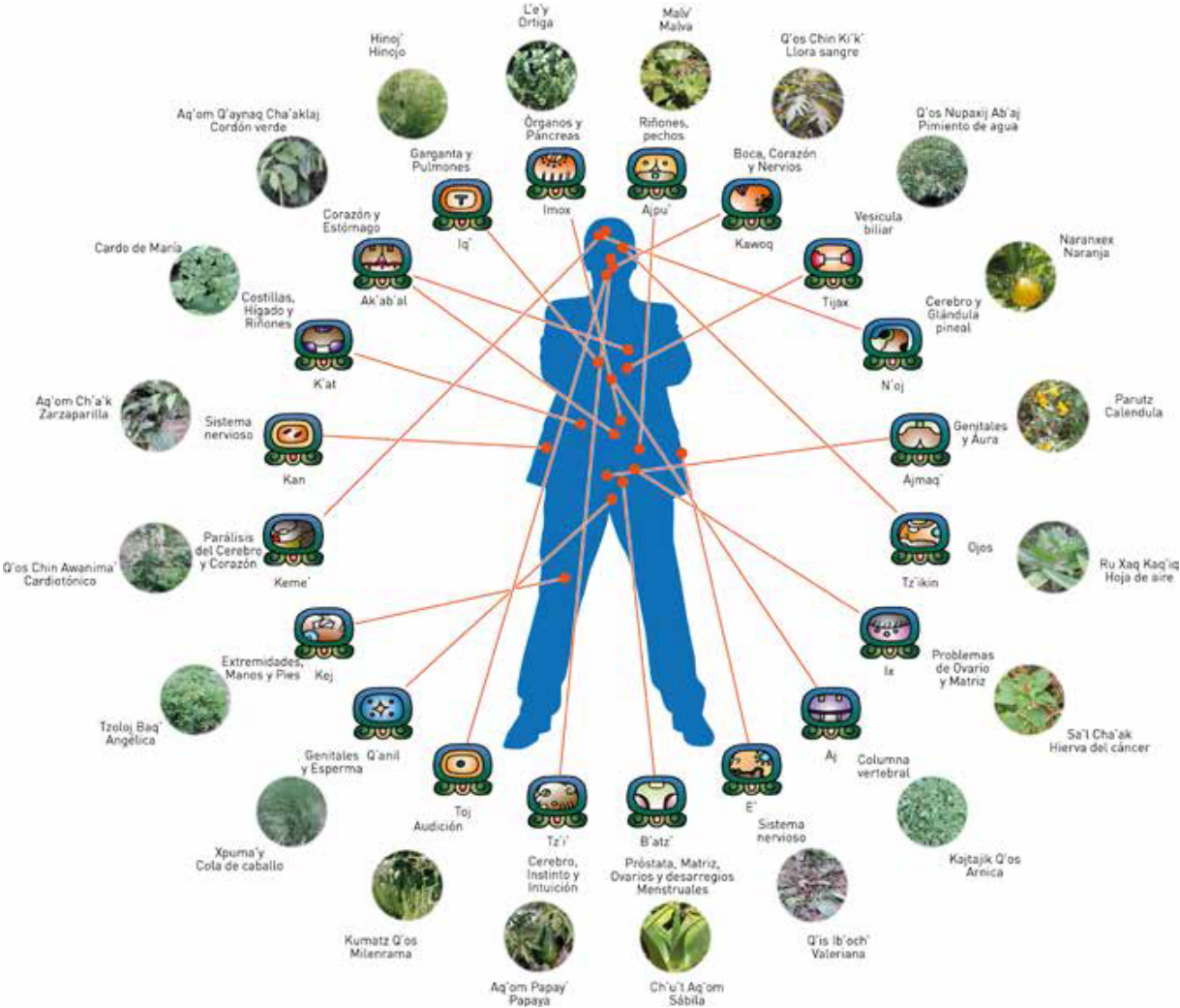
Its 13 leaves of each plant that I use. If the illness is not very severe, a single plant is sufficient, but if the illness is advanced, I make mixtures from 2-13 different plants, taking 13 young leaves of each one (José Caal, Q'eqchi').

The sacred calendar *Cholq'ij* is regularly used in diagnosis in the Kaqchikel, K'iche, and Q'eqchi' areas. It is believed that it represents the movement of the stars that influence living beings and mark changes in human life. Therefore, the *Nawal* [calendar birth sign] of the patients helps to identify causes of the patient's health problems.

First, I calculate the Rajawalq'ij [calendar birth sign] to diagnose the patient's energetic state, since every single one of use has a guardian spirit. In order to be able to cure, is important to verify this Nawal, because sometimes a spiritual disequilibrium goes along with a material one. By means of eggs, cigars, ceremonies the past becomes apparent. One the errors of the patient are apparent, one has to beg pardon to Ajaw. This is spiritual, and in material regards one uses medicinal plants. With these two classes of processes, the healing is successful (Francisca Salazar, Kaqchikel).

According to some healers, the calendar has a profound influence upon their treatment decisions. Specifically, the patient's *Nawal* directly influences the selection of medicinal plants that are required for his cure. They agree that birth signs affect distinct parts of the human body, and that there exists a triangular relation between patients with a certain *Nawal*, the affected organs and specific plants whose spiritual properties specifically favors to heal the areas affected by the energy. This is illustrated in Figure 3, which exemplarily describes relations between organs, plants and the 20 *Cholq'ij* day signs [equating the 20 main birth signs], according to Simeón Taquirá [Kaqchikel].

Figure 2: Relation of the 20 Nawales [calendar signs] to parts of the human body they tend to affect, and examples of plants, whose properties provide them with high utility in treating such energetic illnesses. According to S. Taquirá (Consejo Mayor de Médicos Maya'ob' por Nacimiento, 2016).



Thus, it is obvious that the use of medicinal plants cannot be separated from other elements of Mayan spirituality. Plants are sacred elements, whose functions are balancing, due to the energies of the Creator spirit and everything that lives on Mother Earth. The majority of healers refer to the “energies” of the plants, and their spiritual-energetic relations with the universe and the patient. Behind these thoughts, one can see cosmological principles applied in Mayan phyto-therapy.

Thanks to our spirits who helped us a lot, as well as to the medicinal plants, which worked well. There are always three most important things that go alongside each other: The sacred ceremonies, medicinal plants, and our Mother Earth and our spirit ancestors who we ask for strength (Francisca Salazar, Kaqchikel).

3.4 Conclusion

This synthesis demonstrates the elaborate material techniques and species compositions that are used in conjunction with other treatment elements to heal complex illnesses. Plants are also playing crucial roles in spiritual procedures such as fire ceremonies, in which they can be used for various ends. These practical uses are embedded in a system of meanings in which plants are seen as sentient beings and as our elder siblings, whose pristine equilibrium can heal us in moments of sickness and pain. Becoming a Mayan phyto-therapist implies entering into permanent relations with Mother Earth, plants and everything that exists on it. This skill is both a special gift due to specific birth signs, and a capability that constantly develops through education and spiritual revelation. Specific techniques and protocols vary, but the key idea of maintaining and strengthening these energetic relationships is to pay due respect to the spirit world and all sentient beings, expressed in ceremonies, prayers, blessings, enchantments or spiritual nourishment.

Healing is perceived to be the result of material and energetic effects the phyto-therapy has on the patient. For ‘natural’ illnesses that are generally considered less severe, the healer selects a therapeutic strategy mostly based on the plants material effects, either drawing from his experience or specific spiritual guidance. For ‘malign’ illnesses with a strong energetic component, the plants energetic characteristics become more important. These originate from the plant’s own guardian spirits and influences of cosmic energies, which they are believed to express. Such influences depend on the location and elevation in which the plants grow, lunar cycles, and calendar correspondences between patient’s birth signs, certain illnesses, and particular plants. According to the requirements of the illness, the healer takes these influences into account, adapts the phyto-therapy, and embeds it into an additional spiritual treatment dimension. The key idea is to balance the energy of the patient by means of an energetic triad of the energies of the cosmos, the energies of the healer, and of the plants.

4. Holistic treatment strategies in Mayan medicine: an observational case study approach

Original publication: Hitziger M*, Vides-Porras A*, Salazar Guaran GF, Heinrich M, Edwards P, Krütli P (submitted to Culture, Medicine, Psychiatry): *Holistic treatment strategies in Mayan medicine: an observational case study approach*.

4.1 Abstract

Many non-Western cultures, including the Mayan, have a holistic perspective on health and illness. While there seems to be conceptual agreement on Mayan medicine being holistic (a feature it shares with many other non-biomedical systems), there have been no studies of how this attribute plays out in the construction of healing interventions in the context of patient-healer consultations. In this paper, we explore how the Mayan world-view, with its holistic principles of interdependence and interconnectedness, influences the work of one traditional healer. The study is based upon observations of 187 healer-patient consultations made over a two-year period and interviews with the healer about her work.

Most consultations are multifaceted, involving several problems and treatments and encompassing several personal and social dimensions. By coding these dimensions, we could quantify their frequencies and demonstrate the commonest associations of ailments and treatments using a cluster analysis. Qualitative vignettes reveal the co-construction of problem etiologies by the healer and the patient. They also illustrate the scope and complexity of ailments and the combinations of psychological, spiritual, emotional and physiological treatment interventions that are tailored to each patient history.

This paper presents the first case study of how contemporary Mayan world-view and beliefs in Guatemala translate into a holistic healing practice aimed at restoring equilibrium to a patient's system of relationships. Results discuss the contribution of Mayan knowledge to the conceptualization of holism, health and wellbeing. Given that Mayan traditional medicine serves as primary health care provider for the majority of the country's indigenous population (41%), a more complete understanding of the conception of holism and the construction of interventions is a precondition for better collaboration among traditional healers and biomedical practitioners working in predominantly indigenous areas. Currently, biomedical health services remain inaccessible to most Mayans due to economical, linguistic and socio-cultural barriers.

4.2 Introduction: Holistic interventions in Mayan healing

In holistic medical systems treat the sick individual, the healer and their society have a shared symbolic reality (Kleinman 2011). In such systems, holism permeates to the core of the explanatory model of an illness or problem – how individuals make sense of their illness, including the causes, effects and relationship with other areas that are culturally associated (Kleinman 1975). Ideas on holism are not uniform and identical globally. However, they all follow a series of principles including an understanding of the body and mind as a unified system, one that is intimately connected to social, political-economic and biological systems, and is greater than the sum of the component parts (Coulter 2004; Erickson 2008). Although the expression of holism in particular interventions may differ from region to region, they share a view of the body and its connection to the mind and social dimensions of the human experience (Mark & Lyons 2010), and treat ideas such as balance and harmony as key elements of well-being (Lowenberg & Davis 1994).

In practice, holistic healing interventions are often aimed at changing the individual rather than the conditions that create and/or promote illness and disease (Baer 2004; McKee 1988), thus having a predominantly personal focus (McKee 1988; Williams, 1998). However, holism does not stop at the boundaries of the body, but takes personality and the environment as key elements (Douglas 1994), and attempts to influence a patient's life beyond its materiality. In this sense, illness cannot be situated in body or mind alone (Kapchuk et al. 2008; Kapchuk 2011), but is embedded in a context that includes the whole person, family relationships, members of the community, and the spiritual realm (Frank and Frank 1991). Thus, "healing is situated at the interface of the cultural system, the system of social relations and the individual" (Kleinman 2011).

Mayan medicine is a highly developed holistic system. Healers use the spiritual, emotional, family and community spheres (Berger-González et al. 2016c), as well as medicinal and ritual plants (Hitziger et al. 2016a), to determine the origin of diseases and to heal patients. In Mayan world-view, health (Maya Kaqchikel: Raxnaq'il nuk'aslemal – well-being in our life) arises from equilibrium in four interconnected levels of existence and interaction: (1) the patients and the personal dimensions that constitute them, (2) its family and community, (3) mother earth and all beings, and (4) the entire cosmos (Berger-González et al. 2016c). This equilibrium is defined through relations of coexistence, harmony and respect within and among all four levels. For this reason, interventions are aimed at these four levels, thus transcending the body/matter of the patient and incorporating the mind/thought, and spirit/emotions. Disease is defined as disequilibrium and distorted relations that may be manifested through physical, emotional, mental or spiritual symptomatology, or material scarcity. In other words, holism in the Mayan world-view requires the understanding of the interaction and integration of the different levels of reality. The treatment interventions aim at restoring equilibrium among the four interconnected levels, and thus reflect their interdependence.

So far, there have been no studies on how Mayan beliefs about the integration of personal, social and spiritual realms influence medical interventions. In this paper, we address this research gap and show empirically how the abstract conceptualization of the patient as part of a continuum of individual, society, nature and cosmos (Vides-Pórras 2016) plays out in the daily practice of one Mayan healer, and how the restoration of the patients' equilibrium takes place through the incorporation of these dimensions into the provided treatments. This paper also seeks to advance current knowledge on the concept of holism with its different understandings through detailed empirical information that shows how

abstract principles are reflected in the consultation setting presented. A concurrent goal is to search for potential areas or articulation between traditional and biomedical health care providers in the treatment of specific populations.

4.3 Background and methods

4.3.1 The healer – a short portrait

Nana Francisca Salazar³, born in 1975, is a 40 year-old Kaqchikel healer. Her knowledge about her spiritual mission developed during her childhood and adolescence. She has three healing specialties as *Ajq'ij Ajq'omanel* (Kaqchikel: day-keeper, spiritual guide and herbalist), *Iyom* (midwife, prenatal and neonatal care), and *Aj Paxamail Qati't Qamama'* (vessel, able to communicate with spiritual teachers while awake, and able to perform delicate healing interventions pertaining to the spiritual dimension of *Itzel Yab'il* or malignant disease, Berger-Gonzalez et al., 2016a). Often, the sacred mission of a healer is revealed by suffering, believed to be brought by an imbalance that causes severe illness. This eventually leads to the discovery of the sacred mission defined by the *Cholq'ij* sacred calendar (Tedlock 1992). Nana Francisca was not the exception. When she was 8 years old and sick, her uncle, who was an *Ajq'ij*, looked up her *nawal* (birth day symbol in the sacred *Cholq'ij* calendar) and determined that her sickness was indeed related to her mission to heal people. For that reason, her family performed a ceremony to request the *Ajaw* or spirits to open the path and help her to perform a good job. From this moment onwards, she committed her life to helping others. Her teachers included not only her uncle but also her spiritual teachers, who continue to act as guides during her consultations. In this sense, the consultations link different levels of hierarchy of sentient beings, connecting the patients to spiritual beings who can help him or her throughout the process. For this reason, her consultations practically always include prayers and offerings.

Nana Francisca was raised as catholic but grew up within a syncretic system. For her, Catholicism and Mayan spirituality are compatible and can coexist. Her consulting room is located outside of the main house but inside her property and shows elements of these two belief systems. The Catholic elements, such as saint images and pictures as well as family heirlooms, are located on top of an altar, as they are related to the realm of heaven (*Ukux Kaj*). Mayan elements such as stones, rock crystals and candles are located at the bottom, as these related to Mother Earth (*Ukux Ulew*) and other natural forces that take precedence in Mayan world-view. Besides the altar and its elements, Nana Francisca has also *petates* (reef woven mats) that she uses when she needs people to lie down on the floor to perform massages or examinations, as well as chairs and memorabilia of different activities in which she has participated. The altar is usually adorned with flowers and candles, which are purchased by her or brought as an offering by her patients.

Three times a week, Nana Francisca receives around twelve visitors and their families. She was also a nurse apprentice, which allows her to treat non-Mayan patients, since she understands how to relate to patients accustomed to the biomedical system. Through her ability to adapt to the different codes of patients from Mayan and non-Mayan backgrounds, her healing skills are even requested from overseas. So far she has treated patients in Spain, Switzerland and the United States, predominantly through spiritual interventions but also by shipping medicinal compounds. Nana Francisca thus receives many patients

³ Nana Salazar consented to using her real name.

with whom she uses Spanish as conversational language and she has the necessary openness to document her practice. She was therefore selected as case study of contemporary Mayan healing.

4.3.2 Ethics & institutional framework

The research described here formed part of the MACOCC Project, which was performed in Guatemala from 2011 to 2015 (Berger-Gonzalez et al. 2016b; Hitziger et al. 2016a). It was based on a Memorandum of Understanding between ETH Zurich and 5 Councils of Maya Elders. The Councils established contact with locally reputed healers and secured consent about their participation. Nana Francisca was among them. To gain access to the consultations and to specifically collect data for the present publication, the researchers followed a spiritual permission process requested by Nana Francisca. Firstly, she asked her spirit guides through meditation whether the researchers could visit her house to learn about her ways of healing. Secondly, each afternoon before the beginning of the consultations, the healer requested permission and the researchers joined her in a prayer and the offering of candles. The informed consent of patients was secured before each consultation, and the healer offered each visitor that researchers would leave the room at any time upon their request. No remuneration was given.

4.3.3 Data collection & analysis

The data is based on structured participant observation, conducted from June 2013 to May 2015 by two independent observers (one male and one female) over twelve weeks, which were divided into four observation periods. The observations took place at Nana Francisca's house. Each consultation was observed and documented with particular emphasis on the problems that patients presented and the treatment strategies that were used. The researchers avoided interfering during the interactions. Demographic data not explicitly part of the exchanges, such as age, were thus estimated (age groups: Babies, Children & Adolescents <20a, Adults 20-59a, Seniors >60a). For a subset of cases, the observation data were complemented by semi-structured interviews with Nana Francisca. Finally, any plants mentioned during the consultation were collected and botanically identified at the Herbarium of Del Valle University in Guatemala City.

Many consultations concerned various problems affecting several people, some of which were presented by family members on behalf of absent patients. The basic unit for analysis in the subsequent sections is thus one patient problem rather than one consultation. The sample is described in section 4.4.1. A classification scheme was developed to code the observed problems and treatments, starting from emic categories used by Nana Francisca. However, to reduce the number of variables, we combined some of her categories. Minor aggregation was sufficient to arrive at a scheme of 22 treatment elements and treatment functions, which thus represent emic concepts. The diversity of emic problem descriptions, however, was high and required strong etic aggregation. For this, we used a scheme developed for Mayan medicine (Hitziger et al. 2016a), with some modifications to fit Nana Francisca's practice. This resulted in 13 problem dimensions. Each variable was coded on a binary basis, identifying whether or not it was present in a patient problem. All variables with at least 10 observations (to reduce noise and increase robustness) were included in a hierarchical cluster analysis to detect principal treatment strategies to specific medical syndromes. This method allows detection of clusters of frequently co-occurring variables, without analysing for predefined models. It is thus appropriate for exploratory analyses.

We used the *ward.D* algorithm in the *hclust* function (R version 3.2.2, R Core Team 2015), run on a Euclidian distance matrix. This analysis identifies variable groups that frequently co-occur in the same treated problems. Results of these analyses are presented in section 4.4.2. In section 4.4.3, case vignettes illustrate how Nana Francisca links problem dimensions, treatment elements and strategies in complex, extended therapies that transcended individual problems and patients.

4.4 Results

4.4.1 Sample description

We observed 187 consultations, representing 305 patient problems. Since some problems involved several patients, total of 335 patients were treated. For 69% of problems, the patients were present during the consultation, whereas for 28%, the treatment was aimed at a patient or patients absent from the consultation; 4% were mixed, with some patients present and some absent. 59% were females, 34% males, and 7% were babies for whom no sex was mentioned. The majority of patients were adults (59%), followed by seniors (16%), children and adolescents (16%), and babies (8%). In general, the patients had a Mayan cultural background, with a minority of non-Mayan background, and a few individuals of European descent.

4.4.2 Problem and treatment classification, and treatment strategies

Table 6 shows the classification of the problems and treatments. Most problems were assigned to two categories and some to as many as six; very few could be assigned to a single category. Likewise, most treatments consisted of several elements. Absolute numbers of coded problems and treatments thus exceed the number of patient problems.

Most frequently, problems were considered to be medical and/or spiritual-energetic, reflecting the fact that spiritual concerns were often referred to as ultimate cause of medical problems. In only 17 cases was the problem exclusively of a spiritual-energetic nature. In 80 cases it also had a medical, social, or some other dimension. Among the medical problems, several problems were relatively common, including the Central Nervous System and Behavioral Problems, Tissue Problems and Infections, and problems of the Digestive System.

The different treatment interventions (T1-T9) reflected approaches to alleviate the problems and addressing their etiology. Most prominently, they comprised spiritual activities, either by the healer and/or by the patient, and herbal and/or non-herbal medications. By their nature, all consultations also implied some degree of direct psychological, emotional, or spiritual support, which was thus not coded separately. The medications usually consisted of 1-5 herbal or non-herbal ingredients. They were derived from a total of 92 identified botanical species and/or some non-herbal ingredients like rattlesnake powder or pharmaceutical products.

Each of these ingredients had one to four therapeutic functions (F1-F14), thirteen of which were reported more than three times. Some of these functions referred to specific problems or organ systems, for example “against stomach and intestinal problems”. However, most referred to generic pharmacological effects, such as “purgative” or “analgesic”. Nine functions were reported more than ten times, the most frequent being “anti-inflammatory”, “antibiotic” and “wound healing”.

Table 2: Classification of observed problems and treatments. General problems dimensions (PG1-5) and medical sub-categories of PG4 (PM1-10, modified from Hitziger et al. 2016a). Treatment interventions (T1-9) and functions of applied medications (F1-14, subcategories of T7 & T8). Each variable is defined through the most common emic concepts aggregated in it, and/or explanations that are based on field observations and interviews. Frequency of observation in absolute numbers and percentage.

	Class	Definition / most common emic concepts	F	%
Problem Cl.	PG1: Spiritual-Energetic	Supernatural-energetic problems, Itz'el Yab'il (Berger-González et al., 2016a)	97	23
	PG2: Social Relations	Family problems, emotional relationships	68	16
	PG3: Economic-Work	Lack of funds, debts, joblessness	46	11
	PG4: Medical	Cysts, ulcers, diarrhea, gynecological, diabetes, stress	206	48
	PG5: Other	Victims of crime	12	3
Medical Class (specifies PG4)	PM1: Digestive System	Stomach problems, diarrhea, constipation	69	23
	PM2: Urinary System	Kidney problems, urinary problems	13	4
	PM3: Respiratory System	Throat problems, cough	20	7
	PM4: Cardiovascular System	Circulatory problem, weak heart	5	2
	PM5: Gynecological Problems	Uterine / ovarian problems, menstruation	25	8
	PM6: Tissue & Infections	Cysts, ulcers, gastritis	47	15
	PM7: Central Nervous System & Behavioral Problems	Sleep problems, depression, nerves, headache, stress	39	13
	PM8: Blood, Immune & Endocrine System	Diabetes, allergies, anemia	25	8
	PM9: Musculoskeletal System	Pain in limbs, arthritis	31	10
	PM10: Other	General, unspecific pain, fever, drugs	30	10
Treatment Interventions	T1: Spiritual Treatment by Healer (outside of the consultation)	Ceremonies, spiritual interventions performed by Nana Francisca, drawing on her specialization as vessel	118	26
	T2: Spiritual Engagement of Patient (outside of the consultation)	Spiritual duties to be performed by the patient: prayer, ceremonies, offerings	63	14
	T3: Spiritual Treatment to third Person	Ceremonies of spiritual interventions by Nana Francisca, aiming at third persons to relieve the patient's problem	17	4
	T4: Social Interventions	Mediation between patients and other persons by Nana Francisca	8	2
	T5: Behavioral Interventions	Instructions regarding the patient's daily behavior: diet, physical activity, avoidance of certain places or persons	23	5
	T6: Massages	Pressure & massage to stomach, gynecological organs or intestines	7	2
	T7: Herbal Medications	Use of herbal substances: Teas, baths, compresses, placement of water with petals in the house	160	35
	T8: Non-herbal Medications	Use of non-herbal substances: Pills, pharmaceutical products or powder made from rattle snake or scorpion	57	12
	T9: Other	Various, no frequent concept	7	2
Functions of Medication (specifies T7 & T8)	F1: Purgative		7	2
	F2: Depurative		18	6
	F3: Reduce Blood Sugar Level		5	2
	F4: Anti-parasitic		6	2
	F5: Diuretic		3	1
	F6: Against Stomach & Intestinal Problems		11	4
	F7: Spiritual-Energetic		19	6
	F8: Antibiotic		21	7
	F9: Wound Healing		21	7
	F10: Analgesic		14	5
	F11: Anti-inflammatory		31	10
	F12: For the Nerves / Relaxative / Against Headache		18	6
	F13: Destroy Tissue		18	6
	F14: Other		33	11

Although many cases were multifaceted, certain treatment strategies were systematically used to target particular dimensions. These formed “building blocks” of commonly used treatment approaches, despite of complex individual cases histories. A cluster analysis (Figure 4) distinguished four main groups of variables, of which clusters two, three and four were clearly related to different areas of therapeutic focus. However, cluster one could not be interpreted in this way, as it combined a variety of mostly infrequent variables.

Cluster four suggested an association of the healer’s spiritual engagement in spiritual-emotional dimensions of problems. Cluster three suggested an association between social and economic problems with the patient’s spiritual engagement. Cluster two associated three medical problem categories (digestive system, gynecological problems, and tissue & infections) with four treatment functions (anti-inflammatory, antibiotic, wound healing, destroying tissue).

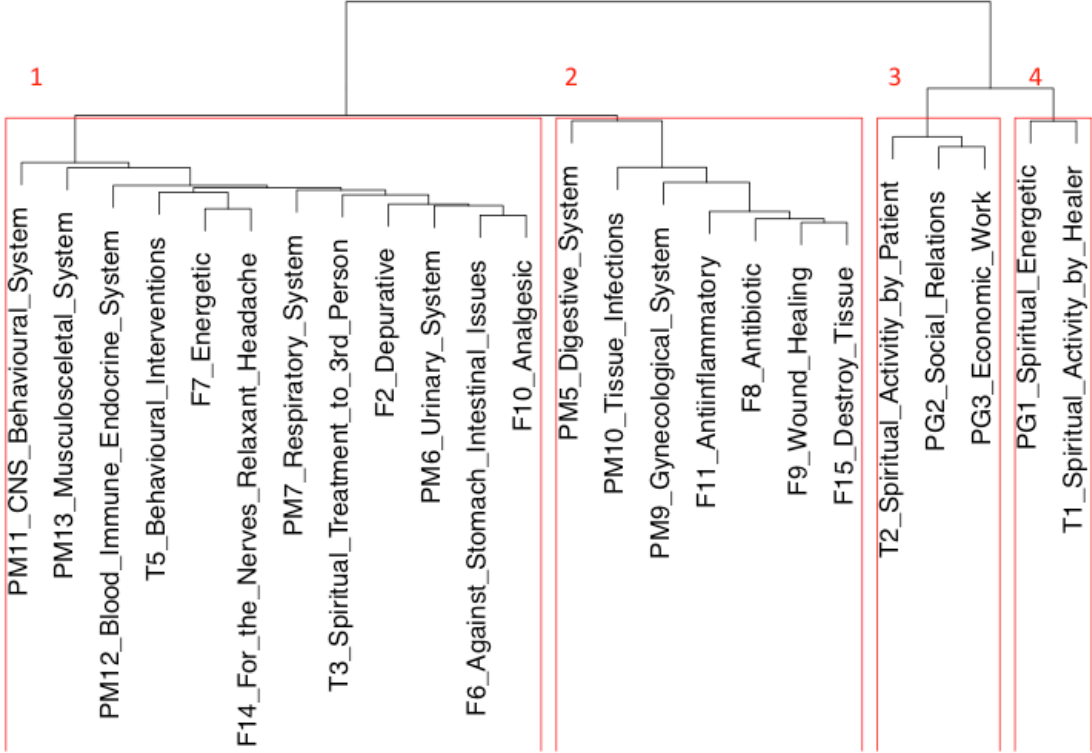


Figure 3: Cluster analysis, displaying 4 associations of attended problems, treatment elements, and functions of applied medications (Cluster 1-4). The analysis applies the Ward algorithm to an Euclidian distance matrix of variables. It clusters those variables together, which frequently co-appear in the same treated problem. All variables with incidence less than 10, and herbal and non-herbal treatment elements excluded (the latter due to their equivalence with the function variables). Variable names cohere with the codes used in Table 6.

4.4.3 Case vignettes⁴

The following case vignettes illustrate how the presented elements in the previous section are combined and integrated into treatment interventions. To help make obvious the different dimensions present into the account, we add following Table 6, different treatment dimensions in brackets: (PG#) to indicate the presence of a general class of problem (1: Spiritual energetic, 2: Social relations, 3: Economic-Work, 4: Medical and 5: Other), (PM#) to indicate a specific type of medical issue, (T#) to indicate the type of intervention performed by the healer and (F) to indicate the specific functions attributed to herbal and non-herbal remedies. It is important to note that all PM and F categories are related to the physical body (with the exception of F7 designated for energetic problems, which also belong to the general category of Spiritual-Energetic issues) and thus coded along with the PG4 symbol. These symbols are used to point out the dimensions in the diagnostic process and interventions as well as the dimensions that come up for the patient's perspective as they deem them relevant in this context.

4.4.3.1 Don José's family: Struggling with the impacts of a sent disease

Mondays are busy consultation days at Nana Francisca's. As she attends her patients inside her house, the other patients wait in line following the order in which they came. Some of them converse while watching the children play in the middle of the patio where everyone is waiting.

Don José came on a Monday and was the tenth patient in line. At the time of the visit he was 63 years old and visited from a neighboring village. José complained about having a swollen colon that was causing him stomach-ache. He also perceived an obstruction when trying to defecate (PG4-PM1). He had been sick for ten days and was still constipated, despite having purchased laxatives (PG4-F1) at the local pharmacy. He said that he had not been eating well, and had been experiencing headaches, sleepiness and weakness (PG4-PM7). As he explained his symptoms, Nana Francisca listened carefully, keeping eye contact and focusing on his words. She nodded and made different facial expressions as some symptoms seemed particularly relevant. José came with his wife, Doña Lucía. She had also been experiencing symptoms that included swollen feet, pain on her left side and difficulties for walking (PG4-PM10). As Nana Francisca performed a massage on her feet (T6) and checked her pulse, she said that the first step was to determine the origin of the symptoms. To do this, she asked the patients to light a white candle before going to bed that night and place beside it a container with water. These elements were essential for her to perform a spiritual visit that would help her determine the etiology of the disease and understand what was happening in their house (T1). As she was explaining the procedures, Lucía added that her sons were always fighting with each other and that "there is no tranquility" (PG2). For the time being, she prescribed them a daily glass of tea of "*Ruda*" (*Ruta chalepensis* L.), which Nana Francisca described as a sacred plant that she uses in order to alleviate energetic problems (F7, PG4-F12). Before they left, she said that they would notice a difference as soon as she started working spiritually and when the prescribed medicines started having an effect in their bodies. For Nana Francisca, her spiritual work goes beyond the spiritual visits she performs to her patients during the night. In order to be able to do this, she has to prepare herself by offering prayers, candles and incense to her spiritual teachers and helpers every day at dawn (T1).

⁴ All names of patients and family members were changed.

Two days later José and Lucía visited again, now bringing along José's mother, Hermelinda. They reported positive changes in their condition. After the patients had given details about the previous two days, she proceeded to give her diagnosis. José had a problem in his large intestine that was treatable (PG4-PM1). However, there was a supernatural problem behind his symptoms: *Itzel Yab'il*, a general term for a malignant disease caused by spiritual-energetic mechanisms, which cannot be adequately addressed by purely material treatments (PG1). Within the different categories of *Itzel Yab'il*, this was a provoked or sent disease, which is considered severe. Such conditions progress slowly, are persistent and heal with difficulty with a mixture of ceremonies, spiritual interventions performed by Nana Francisca, and material treatment of the symptoms. This negative energy, which affected not only their health but also their finances and relationships, had been sent to them by their neighbors in response to a problem connected to one of their sons (PG2, PG3), which they had had many years previously. In the case of Lucía, Nana Francisca mentioned that her problem was located in her liver (PG4-PM1), which needed to be cleansed from these negative energies, which was possible through the spiritual and material interventions prescribed by her. Besides her spiritual interventions, Nana Francisca prescribed Lucía a compound of cow liver (T8), and José a plant compound based on '*Alcachofa*' (*Cirsium mexicanum* DC.) and '*Lechuguilla*' (*Sonchus oleraceus* (L.) L.) to heal the affected nervous system (T7, PG4-F12). Hermelinda also had to light a candle in her sleeping quarters to aid Nana Francisca's spirit at night, when she would be searching Hermelinda for a spiritual diagnosis (T1). Twelve days later, the family visited again, this time accompanied by their daughter-in-law Elena and their grandson. José was feeling better, although he reported stomach-ache and "*calor*" in the stomach. Nana Francisca explained that although the plants were working, the spiritual problems were still affecting his body (PG1, PG4-PM1). The prescription for him was to keep drinking his medicine, and the evil would be expelled within 15 to 20 days. Lucía was also feeling better. Her feet looked normal, although she felt very sick every time she drank the liver water. To relieve the nausea (PG4), Nana Francisca prescribed a glass of water with honey (T8). Both had to visit again in a week. After receiving these instructions to control their own illnesses and symptoms, they proceeded to talk about one of their sons, Jorge. Nana Francisca explained that the negative energies around them had "touched him", and that she was going to work spiritually with her guides and spiritual teachers to take away the "negative thoughts" in his mind (PG1). Elena, wife of another son, also presented her case. She was having marital problems and wanted to know if Nana Francisca could help (PG2). Before they left, there were more problems to be presented and solved. The daughter of José and Lucía was having problems with her husband Luis (PG2), who was drinking a lot, spending all his money on alcohol, and not contributing economically to the household (PG3, PG5). Their son, who was 18 months old, was not growing or eating, and 'looked sick' (PG5). Nana Francisca suggested that Luis' attitude had to do with the fact that his Mom was ill-advising him (T4). The last family member considered in the consultation, although not present, was José and Lucía's youngest son, Mario. They requested Nana Francisca to protect him and help him find a job (PG3). As the consultation was coming to an end, Nana Francisca explained that all the family's suffering was related to the negative energies sent to them in the first place.

4.4.3.2 Manuela's children: alleviating the emotional impact of a deceased father

Manuela (35) visited Nana Francisca with her two children, a boy and a girl. The chief complaint was that the children, Andrea (8) and Miguel (10), were experiencing stomach problems (PG4-PM1). This was not Manuela's first visit. Two years earlier Nana Francisca had treated Miguel for continual headaches (PG4-PM7), and this time, after being sick for a couple of days, it was Miguel who suggested visiting her. As the two children were experiencing similar symptoms, Nana Francisca evaluated Andrea first. She asked her to lie down on a "*Petate*" on the floor, and examined her stomach through an abdominal massage (T6). As she examined the little girl, Nana Francisca told the Mom what she was finding. I can feel "a lot of worms," but it could also be just "*frio*". After the exam, she told Manuela what she needed to do, including preparing a medicine based on "*Limón*" (*Citrus aurantiifolia* (Christm.) Swingle), "*Apasote*" (*Dysphania ambrosioides* (L.) Mosyakin & Clemants) and "*Flor de Muerto*" (*Tagetes erecta* L.) (T7). Next, Nana Francisca examined Miguel. As she massaged his stomach (T6), she asked him about the handcrafts he liked to do. She determined that his intestine was swollen and told Manuela how to prepare medicine for Miguel, including "*Mox*", a solution made from oatmeal and water (T7). After finishing the physical examination, Nana Francisca continued to talk and ask Miguel questions. "Have you had any dreams or nightmares? I can tell that you have been getting very angry lately". Miguel laughed, while staring at the floor. "You need to control your mood, otherwise the girls will not want to be with you", Nana Francisca joked (T5). The last one to be examined was Manuela, who received the same type of evaluation. During the examination, she told Nana Francisca that she was feeling desperate about her financial situation. Manuela's husband had died a few months ago in mysterious circumstances, which left the family in a difficult situation, both socially and financially (PG2, PG3). She received the same prescription as Miguel, but was also told to bring flowers to the cemetery for her husband and parents and to light candles for 13 days (T2). A week later, the family visited again. Nana Francisca asked Miguel if he had had any dreams. He answered no. "Have you been crying alone?" Yes. "Have you been sad?" Yes. father's day was around the corner and this raised disturbing feelings for the family, especially since many people in the community were implying that Manuela was responsible for her husband's death (PG2). As Miguel cried, Nana Francisca talked to him about the importance of accepting that his father was in "the other life" now, while she assured him that it had not been his mother's fault. Although the children were now feeling better, Nana Francisca examined them again. In the case of Andrea, Nana Francisca decided only to intervene spiritually by praying for her at night (T1). For Miguel, she prescribed many herbs intended to heal him physically and spiritually (T7). She mentioned that this combination of herbs was designed to push the anger out (PG4-F12), and that it should all be gone in three days. She also spoke to the two children to explain the importance of not crying alone: "that makes you [spiritually] vulnerable and sick" (T5), she said.

4.4.3.3 Doña Juana and Marco: seeking to transform their life

During her first visit to Nana Francisca, Doña Juana (she is about 25 years old) reported that she had had a problem of irregular menstruation ever since her adolescence (PG4-PM5). At one time, this had even been treated in a public hospital, apparently without effect. She also explained that her husband Jorge, who was not present, wanted to have another child, additionally to the two daughters they already had. According to Juana's midwife, however, Juana would not become pregnant again unless she took medication

from a pharmacy. Juana had taken this medication for a while and her periods had returned, but with large blood clots. However, for several months now Juana had been unable to afford this treatment (PG3), and her periods had again stopped. Additionally, Juana also reported headache (PG4-PM7) and described vaginal discharges, which for two years “smelled horribly and contained white clots”. Nana Francisca commented that these problems were sometimes hormonal, but she was worried about the bad smell. To diagnose Juana’s problem energetically, Nana Francisca asked her to put a bowl of water under the bed and to light a candle in her sleeping quarters, to aid the spiritual diagnosis (T1). Two days later Juana visited again. Nana Francisca was still unsure about a diagnosis. This time Juana also mentioned that her husband Marco was an alcoholic (PG4-PM10) and asked Nana Francisca for “purgatives”, to clean his body from the “poisonous substances” that he drinks (PG4-F2). Nana Francisca recommended that Juana bring Marco to the next consultation, so that he would know what was going on and understand why he was drinking. During the third visit, to which Marco also came, Nana Francisca informed Juana that her menstruation was accumulating in her abdomen. She also explained that this was a hormonal problem, with which Juana had already been born (PG4-PM8). Her nightly visits had also shown Nana Francisca a red ulcer in Juana’s uterus, around which there already were some brown areas. Nana Francisca interpreted this as the initiation of cancer, which was in the beginning stages and could be cured (PG4-PM6). Before starting a treatment, further examinations would be necessary, including one at a hospital to confirm the initial diagnosis. Regarding Marco’s problem, Nana Francisca communicated that he had a supernatural, energetic problem. After being asked, the husband confirmed that he had had other girlfriends before he married Juana. Nana Francisca explained that one of these girlfriends had not accepted the situation and was energetically sending him problems, which explained why Marco could not control his drinking (PG1, PG5). Nana Francisca also asked whether Marco’s parents had any problems, and whether these contributed to Marco’s emotional instability. Marco confirmed that this was the case, and stated that he and his parents had fights about a stretch of land, and his parents business was going badly (PG2, PG3). Convinced by Nana Francisca’s accurate inquiries, Marco said he was willing to cooperate in his treatment, but brought up another problem. Two weeks before the consultation, he had arranged to leave Guatemala for the United States in search of work. Since Marco had no money to pay the ‘*coyote*’ (human trafficker) for the trip, a man had promised to give Marco a loan, but then not provided the funds (PG3). Thus, Marco had to cancel the trip and, on top of that, was now afraid of the ‘*coyote*’, who might threaten Marco for having defaulted on the deal (PG5). Nana Francisca smoked a cigar to diagnose the origin of this last problem (T1). Her response was that Marco did not have spiritual permission to go to the US and that he could get that permission in the future, but first needed to be energetically balanced (PG1). Assuring Marco, Nana Francisca decided to spiritually “touch the ‘*coyotes*’ heart”, to make him see that Marco had no ill will of cheating him (T3). Additionally, Nana Francisca commented that this would give Marco time for now to deal with his other problems, and to assist his wife with hers (T4). Illustrating with an example of her own husband, Nana Francisca warned him that going to the US might resolve some problems but cause others. She also offered her help in liberating himself from the “trap of alcoholism”. The immediate prescription was to avoid walking in the streets when drunk, since there was a high risk of being unfaithful to his wife (T5). Furthermore, he should talk to his parents, to get their issues resolved and to stay close to them (T5). As medication, Nana Francisca prescribed Marco a tea (T7) made from grains of “*Alpiste*” (*Phalaris canariensis* L.) to stop Marco’s desire to drink (PG4-F14), “*Apio*” leaves (*Apium graveolens* L.) as a purgative (PG4-F1), and “*Toronja*” fruits (*Citrus maxima* (Burm.)

Merr.) to destroy the alcoholic substances in Marco's body (PG4-F2). Finally, she asked Marco to come back soon in order to smoke cigars to energetically balance himself, and to see whether he would acquire permission to go to the US (T2). In follow-up interviews, Nana Francisca reported that Marco had visited several more times; he had become more balanced and had assisted his wife until he finally left for the US. Juana's final diagnosis was determined as cysts in the ovaries (PG4-PM5, PM6). Nana Francisca prescribed her to avoid acid or fatty foods and to keep sexual abstinence (T5), which was facilitated by Marco's departure. As medication, Juana was to drink a tea a day (T7), made from "*Cola de Caballo*" (*Equisetum hyemale* L.) to reduce the pain (PG4-F10), "*Uña de Gato*" (*Tradescantia commelinoides* Schult. & Schult.f.) as antibiotic and to destroy the cysts (PG4-F8, F13), and "*Fenogreco*" (*Trigonella foenum-graecum* L.) to reduce the inflammation three times a day (PG4-F11). Nana Francisca reported that the symptoms disappeared after 1-2 months, upon which the treatment was terminated.

4.5 Discussion

4.5.1 Methods appraisal

Most patients collaborated with the researchers and looked relaxed about talking about their problems in the presence of observers, including sensitive topics in some cases (see section 4.4.3.3, which was observed by a male researcher). Furthermore, some patients commented that the presence of researchers demonstrated the scientific value of Nana Francisca's practice, and reinforced their decision to visit her for treatment. Occasionally, the presence or the gender of the observers may have affected the course of the consultations. In very few instances, patients asked observers to leave the consultation rooms for short periods or changed to the use of native language to make themselves unintelligible to the researchers. We therefore believe that the observed interactions are mostly representative of Nana Francisca's consultations.

This study is based on qualitative observations and interviews, which were subject to quantitative analysis based on the frequency of dimensions present and strategies used to provide a description of Mayan treatment practice. It was designed to reflect as accurately as possible the processes within the patient-healer consultations and is therefore predominantly emic in its approach, particularly in the treatment-related aspects. However, a more etic approach was inevitable in the data aggregation and in developing the co-constructed problem descriptions. While analyses of case observation data was done by other researchers before (Berry 2008; Finkler 1994), cluster analyses of problem and treatment variables are to our knowledge novel in ethnographic literature. In this dataset, the large number of observed cases allows an empirical method to see how holistic principles are turned into holistic interventions and to discern frequent treatment strategies. This research may however not be representative of Mayan medicine and a good deal of variation should be expected.

4.5.2 Content appraisal

Mayan worldview integrates the natural and social realms in a way that men and women are seen as part of a continuum with their context. The understanding of illness and health is thus not separated from all the other realms of human experience. Mayan therapy, understood as a process of restoring equilibrium, recognizes that harmonious relationships not only within the individual and the different constituting dimensions (body, mind, spirit and emotions), but also between the patient and his/her social networks, the natural world and the wider spiritual realm are necessary in order to achieve *Raxnaq'il Nuk'aslema*. This holistic view of health and wellbeing translates into therapeutic processes designed to embrace all these elements. This means that for instance, a treatment will include prescriptions to improve the patient's behaviors, feelings and emotions; to resolve conflicts with the family and community; but also to take action to repair faults against Mother Earth and its creatures, or the creator and the spiritual world (Taquirá et al. 2016). The classification and vignettes show how Mayan principles of holism and the different dimensions it embraces are addressed throughout Nana Francisca's consultations. While medical problems were observed most frequently, spiritual-energetic and social problems were also common. Often but not always, these diverse dimensions were seen as being causally related. Given that from Mayan worldview, spirituality regulates and determines health-illness processes (Eder and García Pu 2002), spiritual-energetic causes of problems co-appear particularly often with all other problem dimensions and thus form a transverse axis across dimensions.

All three case studies illustrate that patients visit due to some (mostly medical) problem, and how the interactive diagnostic process contextualizes these problems into a wider arena and raises other issues. In the case of José's and Lucía's family, the initial complaint had a physical nature. Through her diagnosis, Nana Francisca determined that the symptoms were sent from members of the wider community ("neighbors") and related it to social ("fighting", "marital problems", "alcoholism") and economic dimensions ("difficulty finding a job"), which extended to 9 patients in the core family. In the case of Manuela's family, the stomach problems raised a problem of spiritual-emotional distress due to the recent demise of the family's father, and the financial consequences this had for the family and the wider community. In the case of Juana and Marco, problems were seen as causally independent. Nevertheless, the interactions in the process of diagnosing Juana's medical problem with a certain economic component (inability to adhere to biomedical treatment due to lack of funds) triggered the revelation of a series of problems affecting Marco: alcoholism, which in turn reveals tensions between Marco and his parents, his ex-girlfriend, and an illicit human trafficker. Thus, the etiologies were "co-constructed" (Williams 1984) within and partly beyond the setting of a consultation, by the patient and the healer, each with their respective rationales and inferential strategies. In this sense, the Mayan patients were not passive objects of treatment but were actively seeking the reestablishment of equilibrium and wellness. Therefore, our use of the term 'patient' equates with the term 'wellness-seeker coined by Harvey (2013).

Of similarly broad scope are the treatment elements. These interventions reflected Nana Francisca's specialization as herbalist and spiritual guide. The use of herbal medications was the most common and played a major role in all three vignettes. The analysis indicates considerable flexibility in designing medications for particular problems due to (1) the small number of main therapeutic functions as compared to the large number of applied plant species, (2) the use of ingredients considered effective for a wide range of problems and functions, and (3) the use of varied ingredient combinations. In addition, spiritual

interventions were a scaffold used to support a great number of other interventions – either by Nana Francisca to the patient (as in the case of José’s family and Juana) by her to some third person (as in the case of the ‘*coyote*’) or by the patients themselves (as with Manuela and Marco). Massages and behavioral changes also played a role in the therapies, as exemplified in the treatment of Manuela’s children and Lucía’s swollen feet. Additionally, Nana Francisca’s education as a nurse is reflected by the use of pharmaceutical products as a complement for the interventions.

The cluster analysis confirms that many interventions distinctively address certain problems. As shown by clusters 3 (Manuela) and 4 (José’s family), spiritual treatment strategies were applied for spiritual-energetic problems as well as for a range of social, economic and work-related problems. The three problem dimensions in cluster 2 illustrate the frequency of tissue problems, in particular ulcers, gastritis and cysts in the digestive system and gynecological organs. Juana’s ovarian cysts are an example of this association. This close association of a wide range of problems that affect various types of tissue has been revealed in several areas of Central America (Kufer et al. 2005; Hitziger et al. 2016a). This analysis illustrates how medications follow a systematic pattern with ingredients of common functional attributes.

The data also reveals how the different dimensions are interconnected and the links between different problem dimensions and treatment interventions are not clear-cut. For example, medicinal plants to heal the body are provided by Mother Nature, the Cosmos and the Creator and are intended to also serve a purpose in the spiritual-energetic and emotional dimensions. The spiritual interventions also have behavioral and cognitive changes associated. Prescribed behavioral and cognitive changes were also intended to reduce spiritual vulnerability and the physical consequences of emotional distress. Finally, the inclusion of various family members in the treatments extended the scope of the problems treated to mediating tensions and resolving conflicts, thereby facilitating mutual assistance and support within and beyond the treatment interventions. The underlying principle of holism that states that entities in the universe are part of a whole that cannot be isolated of its different parts (Shroff 2011) lies at the heart of Nana Francisca’s interventions. These analyses thus show how Nana Francisca comprehensively addressed body, mind and spirit to reestablish harmonic and respectful relations between the individual, the community, mother earth, and the cosmos. It also shows how holism is not a formulaic process that follows the same steps in every consultation but lies in the understanding that human beings are complex entities that are connected at multiple levels to each other and all that exists.

4.6 Conclusion & outlook

Mayan healing processes reflect principles of interdependence and interconnection that are expressed in the concept of *Raxnaq’il nuk’aslemal* (Mayan Kaqchikel: well-being in our life). The application of these principles is based on the understanding that the origin of the disease is associated with imbalances that can be traced to problems or failures in the interaction with other people, their social and natural environment and the spiritual world. This paper is the first empirical description of how a Mayan healer in Guatemala translates these principles into interventions in her daily practice. It is also one of the first efforts that combines participant observation, case based cluster analyses and comprehensive ethnographic description.

The range of attended problems is large and comprises physical, economic, social and spiritual-emotional dimensions. Healer and patients co-construct etiologies that reflect the interconnection of various dimensions of human beings, and other social, natural and spiritual elements. Consequently, the social structure of consultations is complex, often involving various problems of several patients. Treatment interventions represent a microcosm of this wider belief system that understands the patient as an integrated whole seeking for balance - interconnected with, but also interdependent upon, a network of relations to other dimensions of emic reality. There exists considerable flexibility in treating particular problems, though most interventions reflect common emic concepts, as revealed by the small number of medical functions ascribed to the plant species employed. Of those emic concepts, some treatment strategies to commonly attended problems stand out as particularly frequent. In particular, social or economic problem dimensions are usually treated with spiritual obligations that foster the patient's own activity and engagement, while spiritual-energetic problem dimensions were frequently treated with spiritual activities of the healer, which inspired the patient's confidence. Furthermore, there exists a broad class of infections and/or tissue-affecting problems that are fundamentally distinct from biomedical perspectives, but perceived to be closely interconnected in Latin American rural areas; these are systematically treated with herbal or non-herbal medications that represent four functions (anti-inflammatory, antibiotic, wound healing, destroying tissue).

Given that holistic healing systems have shown their usefulness in many cultures, a health care system that integrates some of its principles has the potential of improving health (Shroff 2011). Besides their holistic approach, Mayan healers share with their patients a language and a world-view that informs mutual understanding of the treatment and the logic that follows the interventions. The lack of these advantages in Guatemalan biomedical institutions partly explains Mayan patients' frequent dissatisfaction with these services (Berry 2008). This affinity in terms of perceptions and beliefs allows for continuity in the relationship beyond the healing of a certain condition. In contrast, the national health system in Guatemala lacks the policies to address the needs and expectations of the Mayan population, with the consequence that indigenous people continue to attend the traditional healing system (Cortez & Cerón 2008; Fort & Morales 2004). Thus, the relevance of traditional healers as the most important source of primary health care becomes evident. Understanding the expectations and characteristics that Mayan patients have regarding the healing encounter provides an avenue for increasing the potential for collaboration and integration with the biomedical health system and the creation of a multi-paradigmatic system that is more culturally appropriate and that benefits diverse populations.

Future research should explore common characteristics of different healers' practices and address potential avenues towards a more inclusive health care system. The collected data also offers various avenues for further, refined analyses. In particular, it could contribute to a better understanding how herbal medications are used and provide the basis of prioritising medicinal species for biochemical testing and the production of improved local medications.

5. From medical pluralism to intercultural health care through patient-centered collaboration: bridging biomedical and traditional health systems in Guatemala

Original publication: Hitziger M, Gharzouzi E, Berger-Gonzalez M, Ochaíta Santizo D, Solis Miranda R, Vides-Porras A, Heinrich M, Edwards P, Krütli, P (submitted to Social Science and Medicine): *From medical pluralism to intercultural health care through patient-centered collaboration: bridging biomedical and traditional health systems in Guatemala.*

5.1 Abstract

Biomedicine is the globally dominant health care system but remains functionally weak in many medically pluralistic developing countries. Therefore, intercultural partnerships are envisioned to improve health care systems. However, very few studies aim at bridging the gap between biomedicine and traditional health systems. We present a research design to foster intercultural health: a patient-centered, multilateral boundary mechanism that includes representatives of biomedicine and traditional medicine, as well as scientists and traditional political authorities. It was implemented in Guatemala in 2014-2015.

ETH Zurich and Councils of Elders of two Mayan linguistic groups (Kaqchikel, Q'eqchi') jointly facilitated a transdisciplinary process between the National Cancer Hospital of Guatemala (INCAN), and traditional healers. All partners jointly developed and implemented the research design, which includes workshops, comparative diagnoses and patient referrals. Semi-structured interviews with healers, patients, and family members elicited health-seeking pathways, Mayan diagnoses and treatments. Any used medicinal plants were vouchered and identified. Eight key collaborators were interviewed to evaluate the impact of the research design with regard to creation of mutual access, trust building and its effects on biomedical and traditional knowledge systems.

35 patients of 6 healers participated in the research design. The boundary mechanism created access for patients, and built trust between doctors and healers. Learning outcomes included a reduction of stereotypical attitudes towards traditional healers, improved biomedical procedures due to enhanced self-reflection of doctors, improved Mayan health care due to refined biomedical diagnoses and adapted treatment strategies. The surprisingly beneficial effects of Mayan treatments in individual cases are inspiring and doctors continue to collaborate with healers even after the study was completed. Thus, the design can bridge disparate medical knowledge systems, even in circumstances as complex as in Guatemala. If scaled up and adapted, it could provide a promising avenue to foster intercultural health in similar contexts.

5.2 Introduction

The World Health Organization (WHO) estimates that one-third of the world's population, and as much as half the population in some parts of Africa, Asia and Latin America have no regular access to modern medicine (Bodeker et al. 2005). In many of these areas, non-communicable diseases are on the rise, yet public health systems are still unable to control communicable affections, thus contributing to a double burden of diseases (Boutayeb 2006). At the same time, medical pluralism – the coexistence and parallel use of traditional, alternative or complementary systems of health care – is the rule rather than the exception (Bodeker 2001; Sudhinaraset et al. 2013). Thus, 35 years after an initial observation by (Lee 1982), biomedicine in many developing countries remains dominant in terms of power, prestige and wealth, but still is functionally weak in terms of equitable access and widespread utilization. Since 1978, the World Health Organization (World Health Organization 1978) has promoted the role of traditional medicine, on the grounds of its accessibility, its often respected and locally influential healers, its cultural significance, and even the clinical effectiveness of its treatments (Bodeker and Kronenberg 2002; Bodeker et al. 2006; Pedersen & Baruffati 1985, 1989; World Health Organization 2013). Nevertheless, many traditional health systems remain neglected, poorly institutionalized or even suppressed.

Literature on intercultural health in developing countries is fragmentary (Vandebroek 2013), and mostly concerned with medicinal plants and local health beliefs and practices. Much less has been published how patients interact with different health systems. Exceptions include barriers of access and patient choice (Chomat et al. 2014; Mathez-Stiefel et al. 2012; Young 1981), and perspectives and attitudes to intercultural medical collaboration (Barnes et al. 2016; Kaboru et al. 2006a, 2006b). Suggested methods to initiate collaboration between practitioners and to improve patient care are workshop formats (Bastien 1987), comparative diagnoses as starting point to negotiate and understand meanings (Staiano 1981), and mutual patient referrals to improve health services (Pedersen & Baruffati 1989). There also are more complex approaches which combine such elements into comprehensive research designs (Shankar 2010; UNAIDS 2006). However, few studies on collaborations between biomedical and traditional practitioners are available (Audet et al. 2013; Kayombo et al. 2007). Furthermore, there is a lack of projects conducted in true partnership with local communities from start to finish (Vandebroek 2013).

These researchers frequently report inadequate access, absence of trust and lack of effective communication due to disparate knowledge systems as problems in intercultural medical collaboration. However, we know of no study that (1) applies an integrated methodological design to foster collaboration between biomedical and traditional health systems in a partnership that creates real value to local stakeholders, and (2) takes a systemic perspective on processes triggered by such interventions and empirically assesses outcomes. To address these gaps, this paper presents a transdisciplinary research design as boundary mechanism to foster intercultural health care in medically pluralistic settings. An implementation in Guatemala demonstrates its potential to create access, build trust and bridge biomedical and traditional medical knowledge systems.

5.3 Background

5.3.1 Boundary management – a research design to create access, build trust and bridge knowledge systems

This research was designed to overcome barriers to intercultural health on three levels: access, trust and knowledge systems (Fig. 5). It proposes a 'boundary mechanism' to create these preconditions, and thus enable an intercultural health system.

Barriers to *access* are understood as geographical, organizational or cultural factors hampering patients' to get the medical services they need (World Health Organization 2013).

Trust is essential for social transformation to occur (Gillespie 2012). It is granted due to expectations of encapsulated interests, moral commitments or psychological dispositions (Hardin 2007) – social representations that draw upon collective narratives that are saturated with power, institutions, and history (Moscovici 1984). Trust is crucial for collaborations of biomedical and traditional healers (Kayombo et al. 2007). Transdisciplinary methodologies were proposed

to build trust in research collaborations by (i) building on existing relationships, (ii) use of intermediaries, and (iii) repeated interactions in project work (Harris & Lyon 2013).

Knowledge systems were recently defined as networks of actors, organizations, and objects that bridge knowledge and know how with action (McCullough & Matson 2010). Preconditions for such networks to be effective are access and trust. Furthermore, information intended to influence decision makers' actions should satisfy scientific adequacy ('credibility'), relevance ('salience') and procedural and substantial fairness ('legitimacy') to the actors values and beliefs (Cash et al. 2003). All health systems are also knowledge systems since they make use of explanatory models (EM's) that bridge disease etiology, symptomatology and pathophysiology with treatment alternatives and evaluation of therapeutic outcomes. Because different EM's construct different interpretations of the same illness episode, they can lead to conflicting expectations, miscommunication, and ultimately to poor clinical care (Kleinman 1978).

Boundary management facilitates communication, translation and mediation across the divide between knowledge systems. It involves (i) specialized actors for managing the interface between knowledge systems; (ii) clear lines of responsibility and accountability to opposite sides of the boundary; and (iii) use of 'boundary objects', i.e. collaborative efforts that are adaptable to different viewpoints and robust enough to maintain identity across them (Star & Griesemer 1989). Successful boundary management satisfies three criteria: (i) active, iterative, and inclusive communication, (ii) translations that facilitate mutual comprehension, and (iii) mediation to ascertain procedural and substantial fairness, while retaining adequate levels of relevance and scientific adequacy to all actors (Cash et al. 2003; Pohl et al. 2010; Star & Griesemer 1989).

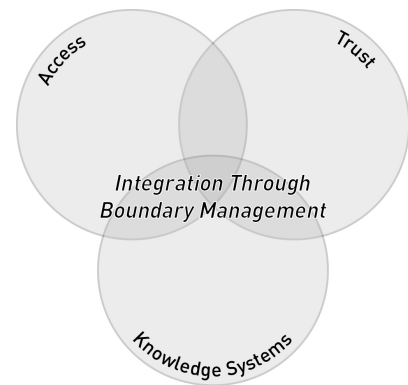


Figure 4: Access as basis for trust building, and both of which as requirements for integrated knowledge systems. Boundary management to facilitate these preconditions to intercultural health systems. Design: 1st author.

5.3.2 Barriers to intercultural health in Guatemala

Guatemala, a medium-sized country on the Central American isthmus, has a population of 15 million people, 40% of which belong to 23 indigenous, mostly Maya groups (Instituto Nacional de Estadística 2014), 52% live in rural areas, and 51% are below the poverty line (Becerril-Montekio & Luis López-Dávila 2011). Non-communicable syndromes are on the rise, and predicted to become leading causes of mortality (PAHO 2007). The history of inequality, racism, oppression, and civil war, which has been described as ‘structural violence’ against the Mayan population, has limited their health care choices and affected their agency in responding to stressors (Farmer 2005; Farmer et al. 2006; Hawkins & Adams 2007; Luján 1999). As an outcome of peace treaties in 1996, Mayan medicine is officially recognised in the Guatemalan constitution, but this has had almost no impact on medical practice (Nigenda et al. 2001). For example, there are no formalized training opportunities and no public funding schemes to support Mayan medicine (Bodeker et al. 2005).

The biomedical health system has four levels: specialized national hospitals, regional department hospitals, municipal health centers, and hamlet-based health posts staffed by medical students or health workers. Access to local health posts is usually good in the sense that the facilities are nearby and consultations are free. However, the cost of treatments may be prohibitive and quality may be perceived as insufficient (Bhatt 2012). Referrals to more specialized higher-quality institutions entails more travel and higher costs. Communication between biomedical practitioners and Maya patients is often difficult because of the linguistic diversity – 24 languages are spoken in Guatemala – and differences in cultural background and education. This difficulty can lead to patients mistrusting biomedicine, as revealed in comments such as “not being attended” or “having to die” (Berry 2008), and many are discouraged from accessing these services (Chomat et al. 2014). This mistrust between the health systems was reinforced by historical events, with traditional healers, as local community leaders, being explicitly targeted in the civil war (Cosminsky 1983). Against this background, it is perhaps not surprising that a comparative analysis should conclude that intercultural health does not work in the Guatemalan case study (Mignone et al. 2007).

In 2010 a transdisciplinary research process was established involving ETH Zurich as the research partner, Mayan Councils of Elders as traditional authorities, and the National Cancer Institute (INCAN) as a representative of biomedicine. It initiated a *dialogue* between the two health systems and documented Mayan medical *knowledge*. The methodology and first outcomes have been described in (Berger-Gonzalez et al. 2016b; Hitziger et al. 2016a). In the following sections, we present an integrated research design to go beyond medical knowledge and dialogue and open up avenues towards *intercultural health care*. It was conducted in two linguistic areas (Kaqchikel Maya in the central highlands and the Q’eqchi’ Maya in the lowlands of Petén).

5.4 Methods

5.4.1 Research design

ETH, Councils and INCAN entered the project with different interests (Table 7). These interests were explained and discussed in workshops, and transformed into mutually agreed project objectives: (1) To conduct workshops in which healers can learn about biomedical conceptions of chronic, pervasive, non-infectious diseases, (2) in each of the two linguistic areas, to identify and biomedically diagnose patients of Mayan healers suffering from such syndromes, and (3) to document their health-seeking pathway, and Mayan conceptions of their illness and treatment.

Table 3: Interests that motivated the main involved partners to participate in the collaboration.

Mayan Medicine / Councils	Science / ETH Zurich	Biomedical System / INCAN
Documentation and valorization of Mayan medicine	Gather scientific data on Maya medicine	Learn about Mayan patients health-seeking pathways
Break cultural and historical barriers	Test a transdisciplinary research design to foster intercultural health	Understand Mayan patients high dropout rates

These objectives took account of each partner's interests. They guaranteed selected patients access to biomedical health services, while offering opportunities for doctors and healers to meet and learn about each others' procedures, diagnoses, and EM's. Biomedicine was presented through workshops, hospital visits and diagnoses, while health-seeking pathways and Mayan medicine were documented through interviews.

The design built upon existing trust relations. On the Mayan side, these extended from Cirilo Perez Oxlaj (indigenous itinerant ambassador of Guatemala 2008-2012), through national and regional Councils of Elders to local healers and their patients. Relations between ETH, Councils and INCAN had been initiated in previous project work, but were extended and deepened through repeated interactions. The joint design and management of the project ensured that the interests and concerns of all partners were addressed, and also helped ensure the scientific adequacy and relevance of the results. In these interactions, ETH researchers acted as external facilitators, neutral to the values and collective narratives of Mayan and biomedical systems in Guatemala. Jointly with the Councils of Elders, they legitimized the process, acted as intermediary between patients, biomedical and traditional practitioners, and mediated in case of misunderstandings, fears or conflicts.

Thus, ETH researchers and the Councils jointly took on the role of managing the interface of traditional and biomedical health systems. Accountabilities towards each side involved compliance with the collaborative approach, agreed objectives, ethical constraints, and financial and administrative commitments. As 'boundary subjects' (Star & Griesemer 1989), we focused upon patients suffering from chronic, pervasive, non-infectious diseases. Despite the considerable differences in how these medical conditions are described and treated by the two systems, our goal was to enable biomedical and traditional healers to interact and coordinate their practices. In this way, the process could provide the basis for 'boundary management' – a space for communication and coordinated interaction that is different from, yet connected, to the realms of the two health systems, in which information can be translated from one system to another and conflicts can be mediated. Figure 6 summarizes this network of involved actors and relations.

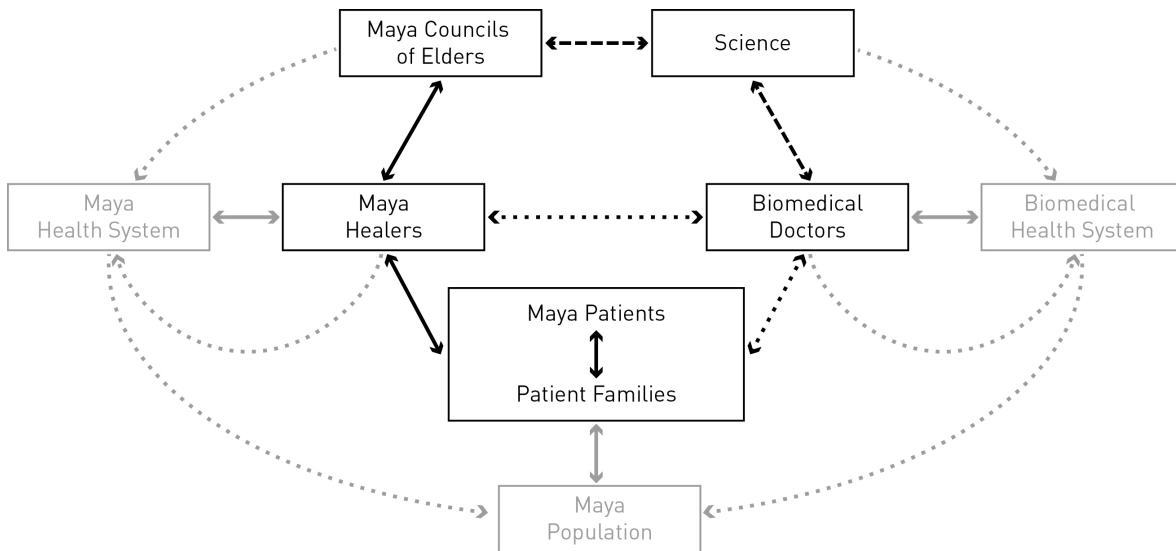


Figure 5: Diagram with actors and relations involved in the study. Left hand side: Mayan knowledge system. Right hand side: Biomedical knowledge system. Top: study coordination and facilitation. Center: Medical systems. Bottom: Maya society. Black: Main actors and relations directly involved in the study. Grey: Contextual actors and relations influencing main actors. Solid arrows: relations that preexist the project. Dashed arrows: Relations established during a previous project (Berger-Gonzalez et al. 2016b; Hitziger et al. 2016a). Black dotted arrows: relations established by the research design. Grey dotted arrows: Potential future indirect impacts of the study outcomes.

5.4.2 Research implementation

The field research was conducted between January 2014 and May 2015. Each partner committed to specific contributions:

1. Overall project coordination was in the hands of ETH, but implemented in a series of formal and informal facilitation and mediation workshops throughout the process.
2. INCAN held training workshops for Councils and healers in a culturally accessible style, mostly based on pictures of symptoms and verbal explanations of chronic, pervasive, non-infectious diseases. They were open to interactive discussions, and healers were asked to suggest and discuss Mayan terms for diseases they saw in the pictures. They clarified the research focus to all participants and provided first opportunities for networking.
3. Healers and Councils proposed patients for diagnosis, that they consider as sick from chronic, pervasive, non-infectious diseases and provided preliminary information to INCAN to schedule exams. ETH and Councils coordinated visits of patients, accompanying family members and healers to INCAN (Kaqchikel area) or departmental hospital (Q'eqchi' area). Regardless of where exams were conducted, INCAN interpreted results,

Ethics: A Memorandum of Understanding (MoU) was signed between ETH Zurich and the Guatemalan Cancer League as the institutional body that runs INCAN. INCAN committed as solely responsible partner for all biomedical decisions and procedures. Diagnoses conducted within this study do not differ in any regard from the medical procedures INCAN follows in its standard medical services. An ethics approval was granted by INCAN's ethical review board.

Collaboration with Councils and healers was based on a MoU between ETH and the National Council of Maya Elders. Procedures of local coordination between Councils, healers and patients were negotiated and contractually documented.

Patients were fully informed by Councils in their native language and signed an informed consent sheet approved by INCAN's ethical review board. In exchange, they received biomedical diagnoses, administrative, logistic and linguistic assistance, and coverage of all incurred costs for themselves and an accompanying person (transport, nutrition, accommodation, time investment).

and decided on follow-up examinations.

4. ETH drafted semi-structured interview guidelines to elicit the patients' health-seeking pathways, Mayan conceptions of the patient's illness and treatment strategies. To gather a multifaceted picture of the Mayan health system, three versions were developed to interview healers, patients, and family members. In the Kaqchikel area, interviews were conducted by ETH researchers in Spanish. In the Q'eqchi' area, interviews were conducted by trained Council members in Q'eqchi' language and translated by a Q'eqchi' linguist. Mentioned medical plants were collected and identified at Del Valle University's Herbarium in Guatemala City.
5. A semi-structured interview guideline was designed by ETH to evaluate experiences and perceptions of the research process and its impact in the two health systems. After concluding the project, an external evaluator interviewed eight key project collaborators: Four Maya representatives (one healer and one Council member in each area), one surgical oncologist from INCAN, and three members of the coordination team.

Therefore, this publication is based on two lines of data: Biomedical diagnoses, and interviews with healers, patients and family members were done on a case-wise basis. They are exemplarily presented in section 5.5.1 and analysed in section 5.5.2. Section 5.5.3 presents and analyses evaluations of the overall project, done with selected healers, elders and doctors, as well as members of the coordination team. This allows comprehensive case descriptions and triangulating assessments and perspectives of all main actors (Figure 6).

5.5 Results

5.5.1 Illustrated case studies

5.5.1.1 Don Manuel (Cog_Kaq_05)

In the first days of June 2014, Don Manuel visited Maya healer Nana Francisca (NF). Don Manuel was from an indigenous background and most of his family spoke little Spanish. He had been operated for colon cancer (right hemicolectomy) in a departmental hospital in 2013, and was subsequently referred to hospitals in Guatemala City for adjuvant chemotherapy. However, he never went there. His wife was an alcoholic and his daughter had become a prostitute, for which Don Manuel felt a duty to watch them 24 hours a day. By this stage he was eating little, suffered from acute abdominal pain, and was pale, weak, and very thin. He had lost the will to live, but still hoped NF could help him.

NF worked to balance him emotionally and raise his confidence and self-esteem. In her diagnosis, she detected a malign spiritual disease (Kaqchikel: *Itzel Yab'il*) due to repeated disrespect towards a local deity, which caused the cancer to persist. She also concluded that he could no longer be healed since "*the light of his life had come to an end*" and the spirits "*had already prepared his path to the other life*" (Cog_Kaq_05_h). Despite Don Manuel's conviction that the cancer had been removed from him the previous year, he accepted her suggestion to visit INCAN for a diagnosis. On 23rd of June, blood tests and a tomography of chest and abdomen indicated that the colon cancer had recurred, spread to a kidney and the liver, and was in terminal stage. Don Manuel's hemoglobin level was 3.4 g/dl. Medical indications were emergency blood transfusions and palliative chemotherapy. Furthermore, an operation was scheduled in a week's time to avoid his intestines from obstructing (ileostomy), and the family was informed that this would cost 15'000 GTQ (2'000 USD). Don Manuel remained at INCAN for two days, received transfusions until his hemoglobin was raised to 12.7 g/dl and then left the hospital.

NF talked more to the INCAN doctors, inquiring about the operation's risks and consequences on the immediate quality of life of the patient. On June 27th she visited Don Manuel and his family and explained in lay terms what had been discussed with the doctors. After some reflection, the family chose NF's treatment rather than the biomedical one. NF gave Don Manuel two medications containing 7 plant species and one animal compound. One medication was to relieve his pain, the second to cause him diarrhea, to avoid intestinal obstruction. Fire ceremonies gave the family opportunity to reestablish harmony with the spirit world, while visits and talks with NF helped to prepare and accept Don Manuel's imminent departure. According to NF, he calmly left on July 11th and entered "the other life" without any problem.

Later, NF reflected: *"What I told them was that this operation would not be a cure. I told them they should consider it well, to not regret or be disappointed afterwards, but that scientifically and spiritually, Don Manuel did not anymore have much time on earth. [...] One of Don Jose's children asked me: You see, NF, if we had gone alone, we would have paid them, they would have operated him and he would have died anyway? I replied that what the doctors do is help the patient so that the intestines do not obstruct, but not to cure him. These are cultural misunderstandings. This was a very interesting experience, to learn how the doctors deal with situations, and how we deal with them. Since the doctor could not explain the situation to the family, he left this in my hands, so that I would explain it to them. So I took the role as spiritual guide, healer and psychologist. [...] This is how I help my patients in final stages. I ease the pain, I involve the family and I prepare them to accept that one of its members is going to leave"* (Cog_Kaq_05_h).

5.5.1.2 Doña Maria (Cog_Kaq_06)

On December 23rd, 2014 NF received a visit from Doña Maria's husband and his brother. Don Manuel's family had told them that NF was working in a project on cancer. Two months prior, Doña Maria, who was strongly rooted in a local church, experienced a strong abdominal pain. Since then she had been very sensitive to food, slept badly, suffered from diarrhea, and could feel a swollen mass in her abdomen. She had already spent several thousand GTQ (several hundred USD) in visits to medical practitioners, pharmacies, local hospitals, and private clinics (7 total). Some of them gave her massage against colic, while others prescribed painkillers and infusions against gastritis, but none of these treatments gave her more than temporary relief. She had also undergone tomography and ultrasound examinations. The last doctor suspected an advanced stage of cancer and referred her to do an endoscopy with specialized doctors in the capital, which the family however did not arrange. As Doña Maria recalled her reaction upon hearing this diagnosis from her husband: *"I asked him why he cried. I told him that as long as I am not dead, I needed help. I needed prayers, and I told to myself that in God's name I did not have cancer. I had seen the power of God, the wonders that He has done in my live, I knew He would help me stand up again"* (Cog_Kaq_06_p).

NF diagnosed the disease as sent by another person (Spanish: "*Mal enviado*", a type of *Itzel Yab'il*), but still saw hope. She arranged Doña Maria's examination at INCAN on December 26th. This revealed a severe urinary infection (urine with 18-20 leucocytes per microscopic field, normal is 0-1) and leukocytosis (22,540 leucocytes/ml, normal is <11'000). Some tumor markers (CA19-9, ACE y AFP) were negative, but ultrasound exams and tomography revealed a tumor that was strongly suggestive of pancreatic cancer. According to family members, the doctors estimated that she had only three weeks to live, and predicted that

within days her pain would increase until no analgesic could help. Therefore, no treatment was prescribed.

As Doña Maria's daughter recalled, upon arriving back home *"the house turned into a frenzy. Neighbors, other people, catholics, evangelicals, everybody came and left. For one and a half months they were here, came and left, prayed and did all sorts of things. And even now [June 2015] some are still coming"* (Cog_Kaq_06_f). NF conducted spiritual interventions according to Mayan tradition and prescribed a *"strong natural chemotherapy, analgesic and anti-inflammatory medication"* (Cog_Kaq_06_h) consisting of 3 medicinal plant species and two animal compounds. After four months, this treatment was changed to ingredients of moderate strength. Throughout this time (and in June 2015 still ongoing), the family visited NF every 15 days to get more medicine, and independently proceeded with spiritual activities according to their catholic belief.

Doña Maria recalled one day when the pain was particularly severe, but otherwise she showed slow but continuous improvement. Her daughter summarized Doña Marias changes: *"She started feeling better, to eat, to stand up. Now she already does her daily duties, but still gets tired fast. [...] She is still slim, her face darkened somewhat, and she is loosing her long, wild hair. She sometimes is a bit sad, but at other times she does not seem to worry. Spiritually, she is doing better and already walks in the streets [...] Thank God, it is now already six months and here she is!"* (Cog_Kaq_06_f). Furthermore, a tomography taken in June 2015 showed no sign of tumor. This led INCAN doctors to consider the possibility that her illness had been a severe pancreatitis, but even so they were surprised at her improvement. One reflected later: *"We cannot see anything anymore! Even though we could not do a biopsy, it was obvious that she had had something very serious. Her recovery is incredible!"* (Cog_Eval_3).

5.5.2 Process outcomes

After initial workshops given to the healers by ETH, INCAN and local Councils of Elders in the Kaqchikel and Q'eqchi' areas, 16 out of 25 healers showed an interest in participating in the project. Six healers actively participated, and the collaborative process was successfully completed in the cases of 35 patients.

The patients' health-seeking pathways are summarized in table 8 (top row). Only four patients had visited a Mayan healer as their first choice. The remaining 28 patients had spent on average 7 years visiting one or several biomedical institutions, including health posts, pharmacies, private clinics, or local hospitals, before turning to a Mayan healer. Stated reasons for abandoning biomedical treatments were lack of funds (14 patients), disliking the treatment experience (17 patients), and dissatisfaction with treatment outcomes (12 patients). For comparison, table 2 cites similar interviews conducted with 35 Mayan patients at INCAN (bottom row, discussed below).

Table 4: Health-seeking pathways of patients in Guatemala. Top row: Patients of Maya healers interviewed in the present study. Bottom row: 35 Mayan patients at INCAN (Aguilar 2014).

Number of visited prior institutions		Time span between initial symptoms and arrival at Maya healer / specialized institution		Reasons for abandoning biomedical treatment / reasons for late attention of specialized oncologists
Average	Range	Average	Range	
2	1 – 8	7.3 years	2 months – 20 years	Lack of funds, disliking treatment experience, disliking treatment outcome
3	1 – 7	3 years	3 months – 12 years	Lack of funds, geographical access, lack of guidance, and language problems

The prestige of biomedicine among Maya patients is underscored by Kaqchikel cases, where 8 out of 15 patients specifically contacted their healer after having heard that she worked with reputed biomedical institutions in a project specifically targeted at severe problems (in Q’eqchi’ cases, this motivation was not mentioned). In contrast, after completing diagnoses in this study, all 35 patients in this study decided to continue treatments with their Maya healers, despite having the option to choose a biomedical treatment with doctors they now personally knew. Only in exceptional cases was Mayan treatment supplemented to a limited degree by biomedical elements. For example, blood transfusions given to a patient in the Kaqchikel area (section 4.1.1). The range of biomedical diagnoses was wide and varied between the two areas (Table 9).

Table 5: Biomedical diagnoses of 35 patients in the two linguistic areas. Some patients were diagnosed with several medical problems.

Council (Total Number of Patients)	Kaqchikel (15)	Q’eqchi’ (20)	TOTAL (35)
Diabetes & Elevated Blood Sugar Level	2	13	15
Anemia	3	3	3
Problems of Urinary System	1	3	4
Inflammatory Problems	1	3	4
Non-Malign or Benign Tissue Affections	4	7	11
Malign Tissue Affections (Cancer)	6	0	6
Other or no Biomedical Problem Diagnosed	1	4	5

In most cases, Mayan healers accepted the biomedical diagnosis entirely (26 cases) or mostly (6 cases). In only three cases did their assessments diverge grossly from the biomedical findings, and these were partly due to different conceptions of what constitutes medically relevant symptoms. For example, one patient was diagnosed as healthy by INCAN but characterized by its Mayan healer as severely sick due to “*obesity and inflamed tissue*” (*Cog_Kaq_12_m*). In contrast to biomedical diagnoses, however, Mayan healers always interpreted the etiological origins of a disease in terms that were specific to the patient. Frequent categories were natural origins such as those resulting from a patient’s physiology, behavior or diet (19 times), social-emotional origins or “susto” (Lee and Balick, 2003, 12 times) and spiritual or supernatural origins such as ‘sent’ diseases, spiritual misbehavior of the patient or birth signs (12 times, exclusively in the Kaqchikel area). In some diagnoses several types of explanation were invoked; for example, Q’eqchi’ healers often attributed diabetes or elevated blood sugar levels to dietary habits that were a consequence of emotional instability due to severe tensions within the patient’s family.

In all 35 patients, Mayan healers prescribed medications consisting of 1-15 mostly herbal ingredients that were to be taken orally. In total, 80 species were applied, of which 71 (89%) could be collected and botanically identified. Some animal compounds were used additionally. Ritual treatments (26 patients), and behavioral or dietary indications (21 patients) were also frequent. In 12 cases, compresses, herbal baths, steam baths, and massages were used. The treatment strategies were strongly influenced by both etiology and the symptomatology. In the Kaqchikel region, healer stated that biomedical diagnoses had influenced their chosen treatment strategies for 9 out of 15 patients by complementing or confirming their own diagnosis. For example, one patient was initially treated for “*vaginal fluxes, stomach problems and liver problems*” (*Cog_Kaq_02_m*). Since INCAN only found elevated blood sugar levels, the healer changed treatment accordingly. In contrast, we found no evidence that Q’eqchi’ healers were influenced by biomedical diagnoses.

5.5.3 Impact evaluation

Table 10 presents summative variables of the process evaluation. Variables are further explained in the rest of this section.

Table 6: Project evaluations of 8 key collaborators with regards to the perceived outcomes of the process and its impact. Variables coded according to the project impact (except the variables “Generalizability” and “Overall Success”). Pos.: positive impact. Mixed: Mixed impact. None: No impact. Neg.: Negative impact. E.g.: Seven collaborators saw a positive impact of the collaborative process on the pre-project levels of trust between Maya healers and biomedical doctors.

Variable	Pos.	Mixed	None	Neg.	NA
1 Access between patients, healers and biomedical doctors	8	0	0	0	0
2 Trust between Maya healers and biomedical doctors	7	0	0	0	1
3 Trust between Maya patients and Maya healers	1	3	2	0	2
4 Trust between Maya patients and biomedical doctors	2	2	2	1	1
5 Knowledge of <i>own</i> medical system	8	0	0	0	0
6 Knowledge of <i>other</i> medical system	8	0	0	0	0
7 Generalizability of process beyond individuals	1	4	0	1	2
8 Overall success as of expectations	4	3	0	0	1

All collaborators agreed that the research design had significantly improved access and communication among the various Guatemalan actors and that trust between the doctors and Mayan healers was strengthened (Var. 1, 2). This was exemplified in a statement by members of the Q’eqchi’ Council that some of the local doctors and nurses who had conducted exams on behalf of INCAN used to talk about Mayan healers in derogatory terms, but now showed interest in their medical practices and even sought their help (*Cog_Eval_6*). Factors that were specifically mentioned as improving trust were (1) access of doctors to Mayan healers, (2) the experience of having worked together with patients and thus being able to demonstrate the effectiveness of Mayan treatments, (3) the involvement of Councils of Elders, (4) adherence to Mayan procedures, and (5) reassurance that Mayan healers were not responsible for advanced stage presentation by delaying patients’ visits to seek biomedical assistance at INCAN.

Trust between Mayan healers and their patients was assumed to have been strong before the project, whereas trust between Mayan patients and biomedical doctors was assumed to be weak or non-existent (Var. 3, 4). For these variables, responses vary, reporting positive, mixed, negative, or no changes in trust relations. In the Q’eqchi’ area, trust relations

between healers and their patients were reported as strong and unchanged in the course of the project, whereas Council facilitation was reported as crucial to alleviate the patients fears of visiting biomedical doctors. In the Kaqchikel area, two extreme cases were reported. According to one healer, he lost the trust of his patients by suggesting that they might participate in the project. He claimed that the patients accused him of selling his knowledge and risking their lives by allowing them to be involved in human experiments. In the other extreme, one healer reported no problems regarding the patients' trust towards INCAN doctors; indeed, she even experienced a rise in her own prestige, with new patients visiting her so that they could participate in the study. Reported reasons for these very different responses include cultural differences, more advanced acculturation in the Kaqchikel area and the manner in which Councils and healers explained the project and encouraged trust in its potential benefits.

All interviewed collaborators agreed that the project had taught them a lot regarding both their own and the other medical system (Var. 5, 6). Frequently mentioned aspects were (1) learning about each others medical terms, procedures, diagnoses and treatments, (2) mutual understanding of disease classification systems, (3) characteristics of the health systems in general, (4) "cross-fertilization" among Maya healers, (5) understanding Maya patients' health-seeking pathways, and (6) seeing beneficial effects of Maya treatments in some of the patients. It even influenced medical practice in both systems. One doctor stated: *"It opened my eyes to something we usually depreciate. [...] It changed my way of looking at medicine in general. [...] Especially the importance of spiritual healing concepts of Maya medicine, which I think is largely missing in biomedicine. [...] I started to implement some of those with my private patients, obviously adapting it to occidental terms [...]"* (Cog_Eval_3). Similarly one Kaqchikel healer stated: *"I could learn more about the illnesses of my patients and help them better. It helped me to see things in a new way, [...] to develop new medicines, and include new ingredients"* (Cog_Eval_5).

Proposals for up-scaling the process were evaluated controversially (Var. 7). Several interviewees pointed out that few people on both sides were willing to get seriously involved in this process. Many healers were more concerned about the risks and problems rather than the opportunities and benefits; and few INCAN doctors saw value in the research. Participating Kaqchikel healers were reportedly criticized, sometimes severely, by their colleagues for selling knowledge, and one was ejected from his local peer group. Healers also mentioned that some very deep knowledge could not be shared. On the other hand, it was mentioned that the information on the health-seeking pathways of Mayan patients was well received at INCAN, destroying previous misconceptions about Maya healers keeping their patients for a long time, and that the project results might stimulate interest amongst doctors. On the Mayan side, the prestige gained by one healer could potentially serve as role model to spread the word more widely among her peers. Despite the weaknesses mentioned by some respondents, the project was therefore in all responses seen as mostly successful (Var. 8).

5.6 Discussion

5.6.1 Collaborative observational case research: An innovative design

Our research design integrates several previously suggested strategies in intercultural health into a single, coherent design: (1) workshop techniques (Bastien 1987), (2) comparative diagnoses (Staiano 1981), and (3) patient referrals (Pedersen & Baruffati 1989). Whilst this integrated methodological strategy is to the best of our knowledge unique, we introduce three additional, collaborative elements. Specifically, we aim at (4) integrating existing relations of trust between indigenous actors into the research project and (5) empowering local stakeholders (in this case Maya councils, healers and INCAN) by including them in all phases of field research, from joint definition of research objectives to data collection, and partially also in data analysis and dissemination (Berger-González et al. 2016b; Hitziger et al. 2016a).

Finally, we (6) draw on recent discussions on bridging knowledge systems through boundary management (Cash et al. 2003; Star & Griesemer 1989). In the collaborative setting at the interface of biomedical and traditional medical knowledge systems, each “case study” essentially manifests itself in practitioner – patient encounters that are characterized by an open and relatively protected situation, due to the scientific context and objectives of the research, and due to the involvement of intermediary facilitators to whom actors have pre-existing trust relations. This enables communication and learning that would not take place otherwise due to structural violence. Each patient is viewed upon with two sets of contextualized criteria, one from biomedical practitioners and another from traditional healers. By relating to one and the same case, the practitioners have the opportunity to cross-reference their concepts and meanings in situations that each of them will deem relevant, thus helping to elicit interactions and trigger mutual understanding. This is implied by the term ‘boundary subjects’.

Previous research on intercultural health almost exclusively played out in bilateral settings between researchers and local stakeholders (patients, or practitioners of either side). In most cases, science was the sole agenda setter, considering local stakeholders as informants. In few cases, stakeholders were actively involved in decision making and research implementation (Berlin & Berlin 1996, 2004). Projects that aimed at fostering intercultural collaboration among practitioners of different medical knowledge systems were mostly conducted in the development arena, with scientists only involved as observers or evaluators, if at all (e.g. Mignone et al. 2007; UNAIDS 2000). However, in many of these efforts, interactions between traditional and biomedical practitioners were distorted towards biomedicine due to issues of power, education and attitudes (Kayombo et al. 2007; Mignone et al. 2007; Vandebroek 2013). In contrast, our approach rests on a multilateral platform between 4 major groups of actors, all of which are actively involved in research design and execution. Science not only observes or analyses, but moreover facilitates and mediates, assisted by Councils of Elders to secure legitimacy, fairness and relevance from the indigenous perspective. Thus, the project becomes a boundary mechanism, bridging biomedical and traditional knowledge systems with the objective to create access, to build trust and to foster learning on a path towards intercultural health.

5.6.2 Collaborative observational case research: fostering intercultural health

Applying this innovative research design was among the first formalized collaborations between biomedical and traditional health systems in Guatemala and certainly the first one conducted within a research process. Facilitation successfully created access and trust between practitioners of both systems and also has long term implications, since INCAN keeps working with one Kaqchikel healer, and doctors in departmental hospitals remain in contact with Q'eqchi' healers. The impact on trust between patients and healers, and between patients and doctors respectively, shows more ambiguity. This points out how much these impacts are dependent on individual healer personalities and local context and requires more research.

Furthermore, the research on Mayan patients' health-seeking pathways clearly demonstrates their interest in adequate biomedical services. Most of them chose biomedical institutions as the first treatment option, and many Kaqchikel patients contacted their healers specifically for their reputation of working with INCAN. However, it also demonstrated that this demand for access was not adequately met since they abandoned biomedicine in favor of Mayan healers and all patients without exception chose to remain in Mayan treatment after attaining biomedical diagnoses. These results seem valid, since another investigation with Mayan patients at INCAN found similar health-seeking pathways before arriving in specialized care, and only 27.5% of the interviewed patients stated they would recommend the hospital to fellow patients (Aguilar 2014). Thus, upon falling sick, patients may visit several local biomedical institutions without success. In some cases they arrive in specialized care, though by then it may be too late to help them, or they may choose to change to Mayan healers. In either case, they often cannot afford specialized biomedical services, and/or are dissatisfied with its quality. The perspective remains, however, incomplete, as long as there is no data on health-seeking pathways of patients of Mayan healers that do not have an interest in participating in a study that implies visiting hospitals.

The research also provides ample evidence for learning in both systems. On the Mayan side, biomedical diagnoses were in most cases accepted as valid and seen as an opportunity to complement their own diagnoses with biomedical insights. They also influenced Mayan treatment choices in about half the Kaqchikel cases. Furthermore, healers highly valued the workshops given by INCAN, as well as the opportunity to learn from their peers. Doctors were particularly impressed by the social realities behind Mayan health-seeking pathways, the fact that Mayan healers proved "innocent" of previously treating patients arriving at INCAN in very late stages of their disease, and the Mayan treatment effect they saw in some patients. Some practitioners of both systems even reported having implemented these new insights in their treatments.

Generalizing the research process will be challenging due to its strong dependence upon individual personalities, on contextual variables, and the appearance of neglect or resistance from less open-minded representatives of both systems. It should therefore preliminarily concentrate on areas in which it already worked well, to create strong role models that might facilitate subsequent transfer to more difficult areas. However, its design is an important step forward and a potential role model to advance intercultural health in this medically pluralistic country in which health systems are characterized by institutional shortcomings, structural violence, mistrust and lack of mutual understanding. Thus, this project has demonstrated the design as generally valuable and feasible, even under a context as difficult as the Guatemalan one.

5.7 Conclusion

This study is among the first collaborative research projects aiming to bridge the gap between biomedicine and traditional health systems in medically pluralistic developing countries in which parts of the society suffers from structural violence. We present a novel approach to foster intercultural health care in such contexts that goes beyond prior unilateral or bilateral efforts: a patient-centered, multilateral collaboration that includes representatives of biomedicine and traditional medicine, as well as scientists and indigenous authorities. The research design combines workshops and interviews, alongside comparative diagnoses and patient referrals. These are embedded in a transdisciplinary process in which all four groups are involved in defining objectives and procedures, conducting the research and, partially, analyzing and disseminating the data. Building on previously established relations of trust, science and indigenous authorities jointly take the role of facilitating communication, translating information and mediating conflicts across the boundary between health systems, thus ensuring the process is seen as valid, fair, and relevant by all sides.

We show that the design created access, build trust and bridged biomedical and Maya medical knowledge systems in Guatemala, a country with deep societal schisms in which previous efforts towards intercultural health have failed. It provided comprehensive support for patients to access biomedical services, highlighted shortcomings of the current systems and pointed to the need for intercultural collaboration. It also created trust between practitioners of both systems, which shows some long-term effects. The impact on trust between patients and healers, and between patients and doctors respectively, shows more ambiguity. This highlights how much these are dependent on individual healer personalities and local context and requires more research. By bridging knowledge systems, learning effects were observed among all participants, including reduction of stereotypes towards the patients and their healers, improvement of biomedical procedures due to enhanced self-reflection of doctors, improved Maya health care due to refined biomedical diagnoses and adapted Mayan treatment strategies. In a long-term perspective, potentials for integrating elements from both systems remain to be evaluated, but the surprising effects of Mayan treatments in individual cases are inspiring.

In a general sense, similar designs can, if scaled up and incorporated into wider audiences, contribute to reduce structural violence and improve health care in medically pluralistic settings. Whilst it certainly needs adaptation to other contexts, the boundary mechanism to create access and trust and to bridge knowledge systems seems transferable and provides a promising avenue to foster intercultural health in developing countries.

6. Ethnographic documentation and empowerment for intercultural health

6.1 Ethnographic documentation: A rich but diverse tradition

6.1.1 Richness and depth of Mayan medicine

This dissertation contributes extensive evidence on the richness and depth of Mayan phytotherapy. Chapter 2 presents the largest ethnopharmacological collection published to date on Mayan medicine in Guatemala, covering most of the major biomes of the country. It contains close to five times the number of medicinal species that are listed in the current *Vademecum* of Guatemalan medicinal plants (Cáceres 2009). Still, fieldwork indicates that most likely the collection is far from complete, even in those two linguistic groups that collaborated in assembling it. It also demonstrates the adaptive nature of phytotherapeutic interventions, since the Kaqchikel areas ethno-pharmacopoeia applies many introduced species and strongly mirrors the relatively recent rise of non-communicable diseases in the Guatemalan population.

Chapter 3 provides an important link between operational phytotherapeutic knowledge and Maya worldview. It demonstrates the elaborate material techniques and species compositions that are used in conjunction with other treatments elements to heal complex illnesses and describes a Mayan perspective on phytotherapy, emphasizing aspects that are usually disregarded in ethnopharmacological investigations. In particular it describes the meaning of plants as sentient beings, and their connections with other aspects of the universe. It also provides a framework to understand Mayan phytotherapy as an effort to strengthen energetic relations between the universe, the plants and the healer in order to address imbalances that caused an illness in the first place. To the best of our knowledge, this chapter and the book that it is part of (Consejo Mayor de Médicos Maya'ob' por Nacimiento 2016) are among the first publications ever to present Mayan medical worldview from an emic point of view.

Unlike other publications that usually focus on selected aspects of ethnomedical traditions, chapter 4 links all dimensions of Mayan medicine in one single analytical framework. It thus illustrates the large holistic scope of Mayan medical practice and emphasizes how closely Mayan phytotherapy is linked with other treatment dimensions, at least in the practice of the observed healer. It demonstrates how Mayan healing reflects principles of interdependence and interconnection that are expressed in the concept of *Raxnaq'il nuk'aslemal* (Mayan Kaqchikel: well-being in our life, Berger-González et al. 2016b). The origin of the disease is associated with imbalances that can be traced to problems or failures in the interaction with other people, their social and natural environment and the spiritual world. Mayan healing goes far beyond western conceptions of curing (Szawarska 2015), since healer and patient co-construct individualized etiologies that reflect these interdependencies and the healer provides patients with comprehensive support and systematic treatment strategies to restore balance in these interdependent dimensions of the human being.

Assessments of medical effectiveness were not among the objectives of this dissertation. However, many of the applied treatment modalities are potentially active, even from a

biomedical point of view, and the surprising effects of Mayan treatments in individual cases are inspiring (section 5.5.1). Therefore, even though just scratching the surface, chapters 2-5 demonstrate the richness and depth of Mayan phyto-therapeutic knowledge. Furthermore, they suggest its potential effectiveness on top of its emic efficacy. Thus, they refute claims that Mayan medicine had limited scope or depth.

6.1.2 Consistency and consensus in Mayan medicine

To discern consistency and consensus in Mayan medicine, chapter 2 takes an analytic stance, quantitatively comparing the two ethnic pharmacopoeias. Results indicate that the Kaqchikel and Q'eqchi' pharmacopoeia differ in systematic ways that might be explained with their very different environmental and socio-cultural context. The Kaqchikeles seem to be a medical tradition experiencing fundamental change. This is reflected in their higher reliance on introduced plant species that are obtained in marketed and processed form or grown in gardens, while the Q'eqchie's strongly rely on native species collected in their natural habitat. It also reflects in the Kaqchikeles more frequent use of remedies against non-communicable diseases of affluence.

However, a quantitative analysis detected very little consistency regarding applied botanical species and their respective medical uses, not even within the same linguistic group. The first of these observations might be explained by simply not having 'gotten it all' and collected a random selection of knowledge among healers. This is possible and seems at least partly plausible, since the Mexican ethno-pharmacopoeia in a similarly diverse environment contains several times the number of plant species collected in Guatemala (Bye et al. 1995). The second observation could be explained in having accessed different specializations or traditions of healers. However, healers were selected by Councils of Elders according to their high local reputation, skill and their 'unspoiled' Mayan background. All participating healers were Alq'omanel (herbalists), some of them were additionally Ajq'ij (spiritual guides). The diversity in use concepts between healers even of the same area and for the same botanical species thus seems a strong indication that medical knowledge is indeed fragmented.

In contrast, chapter 3 takes a synthetic stance and uses additional knowledge provided by field researchers and a Maya editorial board consisting of three elders from different areas to "weave" a consistent story from individual accounts. It seems plausible that general worldview or 'higher level meaning' is more stable and less easily fragmented than operational knowledge (Rappaport 1979). Some field observations support this assumption, such as the consistent use of fire ceremonies, medicinal plants in general, and the emphasis on healer-patient relationships. Therefore, chapter 3 focuses on general thought rather than applications of individual species. Nevertheless, the approach is subjective since it rests on individuals 'connecting the dots' that were provided by healers. Furthermore, priorities of powerful, 'knowledgeable' or charismatic personalities among the elders that constituted the validation board might have influenced the selection and interpretation of primary data. Thus, chapter 3, and by extension also the book it is part of (Consejo Mayor de Médicos Maya'ob' por Nacimiento 2016), are based on primary data and provide a robust synthesis of some general aspects that are likely more consensual than the operation knowledge presented in chapter 2. Nevertheless, they omit part of the diversity of knowledge and beliefs that are held by individual healers.

Thus, while being rich and deep, Mayan medicine most likely also is highly diverse, at least at the level of operational knowledge. In the context of the Guatemalan history (Cosminsky

1983; Luján 1999), this should not come as a surprise. Consensus might be fostered in the future with the reduction of structural violence, more research and dissemination efforts, increases in healer's literacy and mobility, and new formats of collaborative learning among apprentices (as observed in the Q'eqchi' area), but this is likely to happen on the timescale of generations of healers. Since policies in intercultural health not only imply support of healers in exercising their knowledge but also require assessments of merits and risks of traditional practice, any policy on intercultural health in Guatemala requires two components: Reasoned assessments of Mayan medical practices and structured efforts to disseminate and educate healers accordingly, since the consensual body of knowledge in Mayan medicine is limited.

6.1.3 Implications of the collaborative approach for the ethnographic research

This dissertation applied a collaborative approach in which Mayan stakeholders had important roles in fieldwork design and execution, aiming at their empowerment on top of documenting Mayan culture. Thus, this research has characteristics of a social intervention, which is discussed in section 6.2. Its dual nature has, however, important implications for the ethnographic research (also described in chapter 2). First of all, it was the interest of the Councils of Elders to document Mayan phytotherapeutic practice comprehensively and at depth, thus requiring intense work with relatively few collaborators ("informants"). Furthermore, Councils of Elders selected and contacted healers that represent emically reputed specialists in phytotherapy. This procedure aimed at ascertaining emic depth, accuracy and validity of the documented Maya knowledge and practice. Finally, the transdisciplinary research design touched potentially sensitive topics, such as the collaboration with biomedical practitioners and some research lines that involved patients. While the designs legitimacy, its understanding and appreciation by the healers was strongly supported by the Councils of Elders, willingness of the healers to participate in the research was still required. We could not detect a bias from such self-selection effects in chapter 2 or 3, but it certainly played a role in chapter 4, the data for which we could only collect with a single healer. Therefore, this dissertation presents Mayan knowledge of emically reputed phyto-therapeutic specialists, but does not assess in how far this knowledge is held in the wider circles of Mayan traditional healers or the Guatemalan population at large.

6.2 Transdisciplinarity: empowerment for intercultural health

Chapters 2 and 5 describe research that was conducted in transdisciplinary cooperation with Councils of Elders and INCAN. Despite many calls for collaborative approaches in north-south research (Etkin and Elisabetsky 2005; Vandebroek 2013), the majority of transdisciplinary research is so far conducted in industrialized countries (Bergmann et al. 2010; Haire-Joshu & McBride 2013) and few projects were serious in implementing such efforts in the developing world (Berlin & Berlin 2004; Kayombo et al. 2007). To the best of our knowledge, chapter 2 is the first major ethnopharmacological research project that was co-designed, co-steered and co-conducted with indigenous authorities from start to finish. Chapter 5 most certainly is the first project that goes beyond bilateral collaborations between scientists and one single group of local stakeholders. It employs a patient-centered, multilateral approach that includes representatives of biomedicine and traditional medicine, as well as scientists and indigenous authorities. Science and indigenous authorities jointly facilitate intercultural research that is co-designed, co-steered and co-conducted with biomedical and traditional medical practitioners.

In both lines of research, workshops with all involved stakeholders were held in order to discuss and agree objectives and procedures. In the case of chapter 2, the main objective of the councils was to document ancient phyto-therapeutic knowledge. This required adherence to ethnopharmacological research standards (Heinrich et al. 2009) and thus defined much of the field research procedures. However, the sampling strategy was determined from a Mayan perspective, aiming at a selection of healers that is emically representative for the linguistic groups phyto-therapeutic expert knowledge. Furthermore, the fieldwork was accompanied by workshops to discuss methods, progress and pending decisions. In the Q'eqchi' area, researchers were at all times accompanied by an elder to translate and help build trust with the healers, and a field assistant was trained in voucher collection. Fieldwork was also accompanied by a series of fire ceremonies to ask for spiritual permission and advice on urgent matters of concern. Finally, a core commitment was to publish an easily accessible contribution on Mayan medicine to a Guatemalan audience in local language (ch. 3).

The research described in chapter 5 addresses an additional dimension of complexity, since it aims at bridging traditional and biomedical health systems. In this design, the councils placed high value on workshops to be given by INCAN to Mayan healers. The format of accompanying workshops for project coordination and mutual feedback was continued. In turn, the councils committed to responsibilities in patient search and local project coordination with healers and patients. In the Q'eqchi' area, the council also conducted part of the field research. The main interest of INCAN was to better understand Mayan patients health seeking pathways, reasons for their arrival in late stages of their diseases and their high dropout rates. Therefore, research on health seeking pathways was included among the project objectives. In turn, INCAN took over responsibility for all diagnoses and medical decisions throughout the project.

Including partners from the outset in the research design ensured that the projects would address locally relevant concerns, thus drawing on local *target knowledge*. This implied for example research on health seeking pathways, publications on Mayan medicine to Guatemalan audiences and the conduction of workshops for biomedical and Mayan practitioners. Co-steering the research made sure the process and its results would be seen as feasible and valid, thus drawing on local *transformation knowledge*. This required for example council participation in all Q'eqchi' fieldwork, fire ceremonies to ask for spiritual permission, healer selection according to emic criteria, and objective scientific techniques

to elicit Mayan patients health seeking pathways. Furthermore, the process relied heavily on local *systems knowledge*. Not only was the documentation of Mayan healers' medical knowledge among the project's main objectives, but furthermore, a core component of the research process did entirely depend of INCAN's medical expertise (Classification of types of knowledge according to Pohl & Hirsch Hadorn 2007).

On the Mayan side, documenting their medical knowledge for future generations and strengthening their cultural identity provided a motivation for many elders to open up and to get involved. Especially in the Q'eqchi' area, council members and healers are living quite far from each other (figure 1) and their opportunities for contact and exchange are usually limited. Collaborating in the research provided reasons and resources to meet up for workshops or fieldwork and thus to intensify interactions with their peers. Apart from generating scientific data (sections 2.5, 5.5), this also resulted in considerable "cross-fertilization" between healers, such as the joint exploration of certain areas rich in medicinal plants, exchange of plant specimen or whole medications. The healers acknowledged this benefit in the final validation workshops and various interviews. Additionally, the councils used the project not only for obtaining information and internal networking, but also for outreach activities. For example, the Q'eqchi' council used the "scientific valuation" of Mayan medicine to attract potential new healer apprentices and promoted its "scientific activities" in at least one local radio announcement. One Kaqchikel healer gained additional patients due to her reputation of "working with scientists on cancer". Another one is in the process of writing a book on Maya medicine, which is to be distributed in regional bilingual schools. These observations thus document the networks, self-esteem, and cultural identity that were strengthened by this collaborative project.

As thoroughly discussed in section 5.6, the multilateral collaboration in which ETH and the councils jointly took the role of facilitating communication, translating information and mediating conflicts across the boundary between traditional and biomedical health systems was on a small scale successful in creating networks of access and trust between practitioners of both systems. Learning effects were observed among all participants, including reduction of stereotypes towards the patients and their healers, improvement of biomedical procedures due to enhanced self-reflection of doctors, improved Maya health care due to refined biomedical diagnoses and adapted Mayan treatment strategies. Furthermore, it provided comprehensive support for selected patients to access biomedical services, highlighted shortcomings of the current systems and pointed to the need for intercultural collaboration.

The joint project design, project steering and project execution thus guaranteed that the process would generate value to the Guatemalan stakeholders in terms of their own objectives and criteria. For many, this was an important motivation to get themselves involved into the research design that emphasized repeated personal interactions in different formats, and included facilitation, translation and mediation by intermediaries to whom the partners had pre-existent trust relations. As a result, prior networks were strengthened and new ones initiated, trust was built and learning was triggered both within and between medical systems. While one of the few available accounts on similar efforts warns that successful intercultural medical cooperation is not established easily (Kayombo et al. 2007), this experience demonstrates that it is indeed possible. In turn, the partners highlighted important research questions, contributed to a multifaceted approach that embraced their perspectives and provided crucial input in terms of manpower, skill and expertise that the ETH team was lacking. In short, their contributions also stipulated more innovative and more comprehensive research projects.

6.3 Outlook

To build on and extend this research in Guatemala, several avenues are recommended. Knowledge on Mayan phyto-therapy certainly needs to be deepened and complemented. In particular, aspects of Mayan concepts of human physiology, pathophysiology and illness classifications need more attention. Since this requires deep and comprehensive understanding of emic concepts, we suggest that empowering Maya healers to document and systematize their knowledge would be one viable approach. This could for example be done in collaborative approaches to draft books, much in the line of some of the earliest efforts in American anthropology (Gates 2000; Sahagún 2012). One such effort is on its way, and preliminary outcomes are promising. Furthermore, the collaborative approaches should be further developed and their transferability to other settings should be tested. The main trade-off is between approaches that include and empower weak partners to generate local impact, and designs that emphasize strong and rigorous research to generate outcomes of wider scientific relevance.

Another aspect to develop in the future are investigations of treatment outcomes. The frequent use of complex medications suggests that treatment effectiveness should be assessed with an eye towards synergistic pharmacological effects (Spelman 2006; Verpoorte et al. 2005). Any assessments of outcomes in Maya medicine should also take into account its holistic nature. In spiritual treatments, placebo effects or meaning responses (Kapchuk et al. 2008; Kapchuk 2011; Moerman & Jonas 2002), and psychosomatic or psycho-neuro-immunological mechanisms (Kiecolt-Glaser et al. 2002) are potentially active. Social elements such as engagement of third persons and psychological-emotional counseling are plausible interventions for improving not only psychological well-being but also physical health (Antoni et al. 2006; Eisenberger & Cole 2012). Furthermore, giving patients minor responsibilities triggers their agency and sense of control (Haque & Waytz 2012; Langer & Rodin 1976). From this perspective, the active spiritual engagement required from the patient to address social, economic or work related problems seems a plausible strategy. Some of these analyses could already be performed with the data already collected, but would be strengthened by additional, more focused data collection.

Apart from investigations of active principles, we suggest field based efficacy assessments for which there are some pragmatic suggestions that consider the context of developing countries (Fønnebø et al. 2007; Graz et al. 2007; Verhoef et al. 2005; Victora et al. 2004). The latter should be combined with the collaborative observational case design developed in this dissertation, which needs up-scaling and enhanced medical and biostatistical rigor. In a second step, clinical development of medications could follow, either according to mainstream pharmacology methods, or applying reverse pharmacology approaches to improve traditional medicines for local use (Patwardhan & Mashelkar 2009; Willcox & Bodeker 2004; Willcox 2011; Willcox et al. 2011). As suggested in the Indian context, these elements should be complemented with transdisciplinary development of intercultural diagnosis, treatment and evaluation protocols, and educational initiatives (Shankar 2010). Combining those elements and integrating them into wider audiences, especially political ones, would make such research even more relevant to public health in developing countries.

6.4 Conclusion

This research is among the few major investigations of Mayan medicine in Guatemala. It presents by far the largest published comparative collection of medicinal plants applied by Mayan healers in Guatemala and demonstrates recent cultural adaptations of the Kaqchikel ethno-pharmacopoeia to changes in plant availability and disease epidemiology. A comprehensive synthesis of medical concepts in Mayan worldview illustrates the complexity of Mayan phyto-therapy and describes Mayan healing in the framework of balancing the patient by strengthening the energetic relations between the universe, the medicinal plants and the patients. A comprehensive analysis of one healer's practice illustrates how the abstract worldview reflected in *Raxnaq'il nuk'aslemal – well-being in our life* systematically translates into a holistic yet personalized medical practice of enormous scope. Case observations suggest surprising outcomes of Mayan medical treatments. This dissertation thus demonstrates the scope, richness and depth of Mayan phyto-therapeutic knowledge. However, while being rich and deep, Mayan medicine most likely also is highly diverse. At least at the level of operational phyto-therapeutic practices, the consensual body of knowledge in Mayan medicine seems limited.

Two of the contributions are also among the first major collaborative research projects that apply transdisciplinary concepts in developing countries, an approach often called for yet rarely put into practice. The ethnopharmacological research was jointly designed, jointly steered and jointly put into practice. Results were widely disseminated in easily accessible formats. Thus, it addressed the interests of Mayan and biomedical partners and generated value in terms of their own objectives and criteria. For many elders, this was an important motivation to get involved. A multilateral collaboration with councils, healers and INCAN was the first application of intercultural workshops, comparative diagnoses and patient referrals in a coherent and systematic research design. It emphasized repeated personal interactions in different formats, and included facilitation, translation and mediation by intermediaries to whom the partners had pre-existent trust relations. As a result, prior networks were strengthened and new ones initiated, trust was built and learning was triggered both within and between medical systems. In both approaches, the partners highlighted important research questions, contributed to a multifaceted approach that embraced their perspectives and provided crucial input in terms of manpower, skill and expertise that the ETH team was lacking. In short, their contributions also stipulated more innovative and more comprehensive research.

Therefore, this research addresses two challenges to intercultural health in medically pluralistic health systems. On the one hand, it substantively extends the available knowledge base that is required to actively manage contributions of Mayan medicine to intercultural health in Guatemala. On the other hand, it presents innovative tools for intercultural transdisciplinary collaboration in developing countries and demonstrates their value for both scientific and applied ends, even in a context as difficult as the Guatemalan one. Whilst it certainly needs adaptation to other contexts, its general features seem transferable and provide a promising avenue to empower indigenous institutions, reduce structural violence and foster intercultural health. Expanding these or similar approaches and integrating them with additional elements thus bears great promise for public health in developing countries.

Acknowledgements

Many people in Switzerland, Guatemala and some other countries contributed to making the journey of this project possible. In first instance, I would in like to thank the healers and elders for their trust, commitment, invested time, assistance with coordination and for sharing their knowledge. Likewise, I thank all patients that allowed us to participate in their life and medical experience, and trusted in the benefits of our project. I hope this work will be a small contribution to some of their main interests at stake: improving their lives and strengthening their culture in times of change. I also thank all involved persons in INCAN and Del Valle University, who contributed to making this project even more multifaceted and relevant.

Furthermore, I collectively thank all persons, colleagues and families who invited me to their homes, shared with me their life, introduced me to their country, their culture, their joy and their challenges, and made possible a two-year experience of life as a digital nomad. Some were not only most important colleagues for fieldwork and reflection, but also became good friends and almost family. Dr. Mónica Berger-Gonzalez and Steve White, Ana Vides and Rafael Cárdenas, Jorge Berger and Olga Gonzalez, Anne Bordatto, Marissa Lopez, Daniela Ochaíta, Eduardo Gharzouzi, Francisca Salazar and Paodillo Hernández, Luis Morales and Gloria Quino, and Domingo and Gertrudis Che, as well as all their many children and “primos” ... they not only shared fun time with me, offered me space for a hammock or a room in their house, some even built an additional one for me, or adopted me as son, brother and uncle!

Other contributions in research design, fieldwork, administration and manuscript revision were made by Andrea Aguilar, Dr. Andrés Alvarez, Isabel Alvéstegui-Müller, Hugo Ax Che, Dr. Sara Barrios, Dr. Barbara Becker, Sandro Bösch, Pedro Caal, Hector Cab, Rosenda Camey, Ana-Isabel Enríquez, Alice Hertzog, Carlos Ical, Gregorio Hernández, Hermelindo Maas, Dr. Med. Renner, María Alvarez Ruano, Samuel Secaira, Regina Solis, Dr. Mónica Stein, Tuija Waldvogel and Dr. Caroline Weckerle. A special thanks goes to José Manuel Ramírez Amezcua, Prof. Dr. Susanne Renner, Dr. Rafael Lira Saade, Dr. Marie-Stephanie Samain and Dr. rer. nat. habil. Stefan Wanke who have revised identifications in difficult plant families. I am particularly indebted to Pablo Ax and Maria Che for their honesty, decisiveness and reliability, friendliness and support, Dr. Eduardo Gharzouzi for eternal good mood and almost unlimited openness, Maria Rey for incredible patience in dealing with many hundreds of receipts worth only few CHF each, and Dr. Elfriede Pöll, who spent the better part of her 92nd and 93rd year of life identifying close to 1000 voucher specimen!! What would have work been without you!

Finally, this project would not have started up without Prof. Roland Scholz, Dr. Mónica Berger-Gonzalez and Simeón Taquirá. Even more importantly, it could not have successfully continued without Prof. Dr. Peter Edwards, Dr. Pius Krütli, Prof. Dr. Michael Heinrich, and Prof. Dr. Michael Stauffacher. They helped me in many different ways, and also coached me in the process of writing this dissertation. Without them, the data would be worse, contributions would be less valuable, less succinct, more lengthy, and written in considerably poorer style! Last but not least, Dr. Merlin Willcox came all the way from Oxford for being my external examiner. Funding was provided by the COGITO foundation and by ETH Zurich (CH).

Other Publications

Hitziger M, Ochaíta-Santizo D, Berger-Gonzalez M (2016): Q'ayis ajq'om chin utz qak'aslemal : Fitoterapia Maya en Guatemala. In: Consejo Maya de Guías Espirituales y Médicos de Nacimiento de Guatemala: Raxnaq'il Nuk'aslemal – Medicina Maya en Guatemala. Editorial Cholsamaj, Guatemala C.A.

Hitziger M, Ließ M (2014): Comparison of Three Supervised Learning Methods for Digital Soil Mapping: Application to a Complex Terrain in the Ecuadorian Andes, Applied and Environmental Soil Science Volume 2014, 12 pages.

Ließ M, **Hitziger M** & Huwe B (2014): The Sloping Mire Soil-Landscape of Southern Ecuador: Influence of Predictor Resolution and Model Tuning on Random Forest Predictions, Applied and Environmental Soil Science Volume 2014, 10 pages.

Hitziger M (2009): Culture Diagnostics – classification of 15 world religions according to environmentally relevant worldviews. Natural and Social Science Interface, ETHZ.

Birk J, Lensi R, Karl J, **Hitziger M**, Thrippleton T, McKey D, Glaser B, (2008): Pre-Columbian raised fields in French Guiana couple the actions of human and natural ecosystem engineers: evidence from soil geochemical and physical studies, World Archaeological Congress: Dublin.

Conferences

European Congress for Integrative Medicine 2015 (Copenhagen). Oral talk: *Patient-centered intercultural collaboration: An avenue towards integrative medicine in developing countries with socio-culturally stratified societies.*

Netzwerk Ethnobiologie Schweiz 2015 (Zurich). Oral talk: *Maya phytomedicine in Guatemala – a multimethods exploration.*

Congreso Centroamericano de productos naturales medicinales 2015 (Guatemala).

- Oral talk: *Fitomedicina Maya in Guatemala – Investigación bajo un paradigma colaborativo*
- Member of panel discussion: *El paradigma de los productos naturales medicinales: Academia - investigación - industria*

European Congress for Integrative Medicine 2014 (Belgrade). Mitorganisation des Symposiums *Integrative medicine in developing countries: Intercultural cooperation at the nexus of research and development – a model for improving patient care in socio-culturally stratified societies.* Oral talks:

- *Cooperative diagnostics as a catalyst of cooperation – a science perspective*
- *Maya Phytotherapy: Contributions to an integrative medicine*

Coloquio Antropología y Sociología 2013 (Universidad Del Valle de Guatemala). Oral talk: *El papel de las plantas en terapias médicas Mayas – una investigación colaborativa.*

Curriculum Vitae

Martin Hitziger

1984 Born in Heilbronn, Germany
2004 Abitur, Ev. Seminar Blaubeuren
2008 Mobility Student & Scientific Assistant, ETH Zurich
2009 B. Sc. Environmental Sciences, Univ. Bayreuth
2011 M. Sc. Decision Sciences, LSE London
2012 M. Sc. Environmental Sciences, Univ. Bayreuth

Since 2012 Research assistant at ETH Zurich
Since 2013 PhD Candidate at ETH Zurich
Since 2014 Project Co-leader at ETH Zurich

Contact

Martin Hitziger
ETH Zurich TdLab
Universitätsstrasse 16
8092 Zurich, Switzerland

Tel: +41 789 16 50 37
martin.hitziger@usys.ethz.ch

References

- Adams RN (1997): El Surgimiento de la identidad Maya. In Luján Muñoz J, Contreras JD (Eds.): *Historia General de Guatemala Vol. VI: Época Contemporánea: De 1945 a La Actualidad*, pp. 317–46. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.
- Aguilar EC (1994): Los Cakchiqueles. In Luján Muñoz J, Popenoe de Hatch M (Eds.): *Historia General de Guatemala Vol. II: Dominación Española: Desde La Conquista Hasta 1700*, pp. 533–52. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.
- Aguilar A (2014): Salud pública y medicina tradicional: Una mirada a la experiencia Maya del cancer en Guatemala. Universidad del Valle de Guatemala, Guatemala.
- Ahn AC, Tewari M, Poon C-S, Phillips RS (2006a): The limits of reductionism in medicine: Could systems biology offer an alternative? *PLoS Med* 3: 709–713.
- Ahn AC, Tewari M, Poon C-S, Phillips RS (2006b): The clinical applications of a systems approach. *PLoS Med* 3: 956–960.
- Annis S (1981): Physical access and utilization of health services in rural Guatemala. *Soc Sci Med* 15: 515–523.
- Antoni MH, Luthendorf SK, Cole SW, Dhabhar FS, Sephton SE, McDonald PG, Stefanek M, Sood AK (2006): The influence of bio-behavioural factors on tumor biology: pathways and mechanisms. *Nature* 6.
- Arnstein SR (1969): A Ladder of Citizen Participation. *Am Inst Plan* 35: 216–24.
- Arzápalo M (1987): El ritual de los Bacabes: edición facsimilar con transcripción rítmica, traducción, notas, índice, glosario y cómputos estadísticos. Universidad Nacional Autónoma de México, México, D.F.
- Audet CM, Salato J, Blevins M, Amsalem D, Vermund SH, Gaspar F (2013): Educational intervention increased referrals to allopathic care by traditional healers in three high HIV prevalence rural districts in Mozambique. *Plos One* 8.
- Baer HA (2004): *Toward an integrative medicine: merging alternative therapies with biomedicine*. AltaMira Press, Walnut Creek, CA.
- Balick MJ, Arvigo R (2015): *Messages from the Gods, a guide to the useful plants of Belize*. New York: Oxford University Press.
- Barnes A, Brown GW, Harman S (2016): Understanding global health and development partnerships: Perspectives from African and global health system professionals. *Soc Sci Med* 159: 22–29.
- Barrera-Vasquez A (1987): Las fuentes para el estudio de la medicina nativa de Yucatán. *Biomed* 10: 253–261.
- Bastien JW (1987): Cross-cultural communication between doctors and peasants in Bolivia. *Soc Sci Med* 24: 1109–1118.
- Becerril-Montekio V, López-Dávila L (2011): The health system of Guatemala. *Salud Pública México* 53: 197–208.

Berger-González M, Gharzouzi E, Renner C (2016a): Maya healers' conception of cancer as revealed by comparison with Western medicine. *Glob Oncol*.

Berger-Gonzalez M, Stauffacher M, Zinsstag J, Edwards P, Krütli P (2016b): Intercultural research on cancer healing systems between biomedicine and the Maya of Guatemala: A transdisciplinary approach to induce reciprocal reflexivity in a multi-epistemological setting. *Qual Health Res* 26 (1): 77–91.

Berger-González M, Vides-Porras A, Heinrich M, Strauss S, Taquirá S, Krütli P (2016c): Relationships that heal: Going beyond the patient-healer dyad in Mayan therapy. *Med Anthropol*.

Bergmann M, Jahn T, Knobloch T, Krohn W, Pohl C, Schramm E (2010): *Methoden transdisziplinärer Forschung: Ein Überblick mit Anwendungsbeispielen*. Campus, Frankfurt, New York.

Berlin EA, Jara VM (1993): Me' winik: discovery of the biomedical equivalence for a Maya ethnomedical syndrome. *Soc Sci Med* 37: 671–678.

Berlin B, Berlin EA (1996): *Medical ethnobiology of the highland Maya of Chiapas*. Princeton University Press, Princeton.

Berlin B, Berlin EA (2004): Community autonomy and the Maya ICBG project in Chiapas, Mexico: How a bioprospecting project that should have succeeded failed. *Human Organization* 63 (4): 472–86.

Berry NS (2008): Who's judging the quality of care? Indigenous Maya and the problem of "Not Being Attended." *Med. Anthropol*. 27: 164–189.

Bhatt S (2012): Health care issues facing the Maya people of the Guatemalan highlands: The current state of care and recommendations for improvement. *Glob Health Perspect*.

Bodeker G, (2001): Lessons on integration from the developing world's experience. *BMJ* 322: 164–167.

Bodeker G, Kronenberg F, (2002): A public health agenda for traditional, complementary and alternative medicine. *Am Public Health* 92: 1582–1591.

Bodeker C, Ong CK, Grundy C, Burford G, Shein K (2005): *WHO global atlas of traditional, complementary and alternative Medicine*. World Health Organization Centre for Health Development, Geneva.

Bodeker G, Carter JA, Burford G, Dvorak-Little M, (2006): HIV/AIDS: Traditional systems of health care in the management of a global epidemic. *Altern Complement Med* 12: 563–576.

Boutayeb A (2006): The double burden of communicable and non-communicable diseases in developing countries. *Trans R Soc Trop Med Hygiene* 100: 191–99.

Bye R, Linares E, Estrada E (1995): Biological Diversity of Medicinal Plants in Mexico. In Arnason JT, Mata R, Romeo JT (Eds.): *Phytochemistry of Medicinal Plants*, pp. 65–82. *Recent Advances in Phytochemistry*. New York: Springer Science & Business Media, LLC.

Bye R, Linares E (2015): Perspectives on Ethnopharmacology in Mexico. In Heinrich M, Jäger AK (Eds.): *Ethnopharmacology*, pp. 393–404. ULLA Series in Pharmaceutical Sciences. Wiley Blackwell.

Cáceres A, Menéndez H, Méndez E, Cohobón E, Samayoa BE, Jauregui E, Peralta E, Carrillo G (1995): Antigonorrhoeal activity of plants used in Guatemala for the treatment of sexually transmitted diseases. *Ethnopharmacol* 48 (2): 85–88.

Cáceres A (2009): *Vademecum nacional de plantas medicinales de Guatemala*. Guatemala City: Editorial Universitaria USAC.

Carcache HC (1994): Organización política de los Indios. In Luján Muñoz J, Aguilar EC (Eds.): *Historia General de Guatemala Vol. II: Dominación Española: Desde La Conquista Hasta 1700*, pp. 143–54. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.

Cash DW, Clark WC, Alcock F, Dickson NM, Eckley N, Guston DH, Jäger J, Mitchell RB (2003): Knowledge systems for sustainable development. *PNAS* 100: 8086–8091.

Cassidy CM (2006): Social and cultural factors in medicine. In Micozzi MS (Ed.): *Fundamentals of Complementary and Alternative Medicine*. Saunders, Elsevier, San Louis, Missouri, pp. 42–60.

Castañeda C (2008): Guatemala y su biodiversidad: Un enfoque histórico, cultural, biológico y económico. Technical Report 67. Guatemala City: Consejo Nacional de Areas Protegidas. (accessed: July 17, 2015).

Chomat AM, Solomons NW, Montenegro G, Crowley C, Bermudez OI (2014): Maternal health and health-seeking behaviors among indigenous Mam mothers from Quetzaltenango, Guatemala. *Rev Panam Salud Publica* 35: 113–120.

CIA (2015): CIA World Factbook. <https://www.cia.gov/library/publications/the-world-factbook/geos/gt.html> (accessed: July 17, 2015).

CONAP (1999): Conociendo el sistema Guatemalteco de áreas protegidas – estrategia nacional para la conservación y uso sostenible de la biodiversidad. Guatemala City: Consejo Nacional de Areas Protegidas.

Consejo Mayor de Médicos Maya'ob' por Nacimiento (2016): *Raxnaq'il Nuk'aslemal: Medicina Maya'ob' en Guatemala*. Guatemala City: Editorial Cholsamaj.

Convention on biological diversity (2015): The Nagoya protocol on access and benefit-sharing. <https://www.cbd.int/abs> (accessed: July 17, 2015).

Cortez P, Cerón A (2008): *Estamos enfermos, ¿qué hacemos?: síntesis analítica del informe de Alejandro Cerón*. Amanuense, Guatemala City.

Cosminsky S (1983): Medical pluralism in Mesoamerica. In Kendall C, Hawkins J, Bossen L (Eds.): *Heritage of Conquest: Thirty Years Later*. University of New Mexico Press, Albuquerque.

Coulter ID (2004): Integration and paradigm clash: The practical difficulties of integrative medicine. In Tovey P, Easthope G, Adams J (Eds.): *The Mainstreaming of Complementary and Alternative Medicine: Studies in Social Context*. Routledge, London; New York, pp. 103–122.

Didier B (1994): Los Lacandones e Itzaes. In Luján Muñoz J, Aguilar EC (Eds.): *Historia General de Guatemala Vol. II: Dominación Española: Desde La Conquista Hasta 1700*, pp. 645–62. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.

- Douglas M (1994): The construction of the physician: A cultural approach to medical fashions. In Budd S, Sharma U (Eds.): *The Healing Bond: The Patient-Practitioner Relationship and Therapeutic Responsibility*. Routledge, London; New York.
- Eder K, García Pu MM (2002): Modelo de la medicina indígena Maya en Guatemala: investigación participativa en Sipacapa, San Marcos, San Martín Jilotepeque, Chimaltenango y San Juan Ixcoy, Huehuetenango. Asociación de Servicios Comunitarios de Salud, ASECSA.
- Eisenberger NI, Cole SW (2012): Social neuroscience and health: neurophysiological mechanisms linking social ties with physical health. *Nat Neurosci* 15.
- Erickson PI (2008): *Ethnomedicine*. Waveland Press, Long Grove, Illinois.
- Ethnologue (2015): Ethnologue: Languages of the World. <https://www.ethnologue.com/country/GT> (accessed: July 17, 2015).
- Etkin NL (1988): Cultural constructions of efficacy. In Geest S. van der, Whyte SR (Eds.): *The Context of Medicines in Developing Countries*. Kluwer Academic Publishers, pp. 299–326.
- Etkin NL, Elisabetsky E (2005): Seeking a transdisciplinary and culturally germane science: The future of ethnopharmacology. *Ethnopharmacol* 100: 23–26.
- Farmer P (2005): *Pathologies of power: health, human rights, and the new war on the poor: with a new preface by the author*. California series in public anthropology. University of California Press, Berkeley.
- Farmer PE, Nizeye B, Stulac S, Keshavjee S (2006): Structural violence and clinical medicine. *PLoS Med* 3: 1686–1691.
- Finkler K (1994): Healing and biomedicine compared. *Med Anthropol Q* 8: 178–197.
- Fønnebø V, Grimsgaard S, Walach H, Ritenbaugh C, Norheim, AJ, MacPherson H, Lewith G, Launsø L, Koithan M, Falkenberg T, Boon H, Aickin M (2007): Researching complementary and alternative treatments – the gatekeepers are not at home. *BMC Med Res Methodol* 7.
- Fort M, Morales L (2004): Una imagen objetivo para Guatemala. El sistema público de salud incluyente -SPSI- Preliminar document. (No. 78). Instancia Nacional de Salud.
- Frank JD, Frank J (1991): *Persuasion and healing: a comparative study of psychotherapy*, 3rd ed. Johns Hopkins University Press, Baltimore.
- Gates W (2000): *An Aztec herbal, the classic codex of 1552*. Dover Publications Inc, Mineola, New York.
- Gillespie A (2012): Concluding comment: Contact without transformation: The context, process and content of distrust. In Gillespie A, Marková I (Eds.): *Trust and Conflict: Representation, Culture and Dialogue*. Routledge, London; New York, pp. 201–216.
- Goldman N, Gleit DA (2003): Evaluation of midwifery care: results from a survey in rural Guatemala. *Soc Sci Med* 56: 685–700.
- Graz B, Elisabetsky E, Falquet J (2007): Beyond the myth of expensive clinical study: Assessment of traditional medicines. *Ethnopharmacol* 113: 382–386.
- Gridling M, Stark N, Madlener S, Lackner A, Popescu R, Benedek B, Diaz R, Tut FM, Nha V, Thanh P (2009): In vitro anti-cancer activity of two ethno-pharmacological healing plants from Guatemala *Pluchea Odorata* and *Phlebodium Decumanum*. *Int Oncology* 34 (4): 1117–28.

- Häberli R, Grossenbacher-Mansuy W (1998): Transdisziplinarität zwischen Förderung und Überforderung. *Erkenntnisse aus dem SPP Umwelt. GAIA* 7 (3): 196–213.
- Haire-Joshu D, McBride TD, (2013): *Transdisciplinary public health: research, education and practice*. John Wiley & Sons, San Francisco, CA.
- Haque OS, Waytz A (2012): Dehumanization in medicine: Causes, solutions, and functions. *Perspect Psychol Sci* 7: 176–186.
- Hardin R (2007): *Trust*. Polity Press, Cambridge, UK.
- Harris F, Lyon F (2013): Transdisciplinary environmental research: Building trust across professional cultures. *Environ Sci Policy* 31: 109–119.
- Hart T (2008): *The ancient spirituality of the modern Maya*. University of New Mexico Press, Albuquerque.
- Harvey TS (2003): *K'iche' expression of wellness and illness in disputed fields of care: A comparative analysis of Maya intra-cultural therapeutic and cross-cultural biomedical care*. University of Virginia.
- Harvey TS (2013): *Wellness beyond words: Maya compositions of speech and silence in medical care*. University of New Mexico Press, Albuquerque.
- Hawkins JP, Adams WR (2007): Good medicine: Steps toward a Maya-accessible health care system. In: Adams WR, Hawkins JP (Eds.): *Health care in Maya Guatemala: Confronting medical pluralism in a developing country*. University of Oklahoma Press, Norman, pp. 215–235.
- Heinrich M, Ankli A, Frei B, Weimann C, Sticher O (1998): Medicinal Plants in Mexico: Healers' Consensus and Cultural Importance. *Soc Sc Med* 47 (11): 1859–1871.
- Heinrich M, Kufer J, Leonti M, Pardo-de-Santayana M (2006): Ethnobotany and ethnopharmacology – interdisciplinary links with the historical sciences. *Ethnopharmacol* 107: 157–60.
- Heinrich M, Edwards S, Moerman DE, Leonti M (2009): Ethnopharmacological field studies: A critical assessment of their conceptual basis and methods. *Ethnopharmacol* 124: 1–17.
- Hernández F (1959): *Historia natural de Nueva España*. Universidad Nacional Autónoma de México, México.
- Herrera G (1997): Idiomas indígenas: situación actual y futuro. In Luján Muñoz J, Contreras JD (Eds.): *Historia General de Guatemala Vol. VI: Época Contemporánea: De 1945 a La Actualidad*, pp. 355–66. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.
- Hitziger M, Heinrich M, Edwards P, Lopez M, Pöll E, Krütli P (2016a): Maya phytomedicine in Guatemala - can cooperative research change ethnopharmacological paradigms? *Ethnopharmacol* 186: 61–72.
- Hitziger M, Ochaíta-Santizo DM, Berger-Gonzalez M (2016b): Q'ayis Ajq'om Chin Utz Qak'aslemal: Fitoterapia Maya en Guatemala. In Consejo Maya de Guías Espirituales y Médicos de Nacimiento (Ed.): *Raxnaq'il Nuk'aslemal: Medicina Maya'ob' en Guatemala*. Guatemala City: Editorial Cholsamaj.
- Instituto Nacional de Estadística (2014): *Caracterización Estadística*: República de Guatemala.

<http://www.ine.gob.gt/sistema/uploads/2014/02/26/5eTCcFlHErnaNVeUmm3iabXHaKgXtw0C.pdf> (accessed: July 17, 2015).

Ivic de Monterroso M (2016): Esta enfermedad ¿tiene un dueño? La medicina entre los Mayas del posclásico. In Consejo Maya de Guías Espirituales y Médicos de Nacimiento (Ed.): *Raxnaq'il Nuk'aslemal: Medicina Maya'ob' en Guatemala*. Guatemala City: Editorial Cholsamaj.

Jahn T, Bergmann M, Keil F (2012): Transdisciplinarity: Between mainstreaming and marginalization. *Ecol Econ* 79: 1–10.

Jantsch E (1972): Towards interdisciplinarity and transdisciplinarity in education and innovation. Organisation for Economic Cooperation and Development, Paris.

Jones CL (1940): Guatemala, past and present. Minneapolis: University of Minneapolis Press.

Kaboru BB, Falkenberg T, Ndubani P, Höjer B, Vongo R, Brugha R, Faxelid E (2006a): Can biomedical and traditional health care providers work together? Zambian practitioners' experiences and attitudes towards collaboration in relation to STIs and HIV/AIDS care: a cross-sectional study. *Hum Resour Health* 4.

Kaboru BB, Falkenberg T, Ndulo J, Muchimba M, Solo K, Faxelid E (2006b): Communities' views on prerequisites for collaboration between modern and traditional health sectors in relation to STI/HIV/AIDS care in Zambia. *Health Policy* 78: 330–339.

Kahn HE (2006): Seeing and being seen: The Q'eqchi' Maya of Livingston, Guatemala and beyond. Austin: University of Texas Press.

Kao LS, Tyson JE, Blakely ML, Lally KP (2008): Clinical research methodology I: Introduction to randomized trials. *Am Coll Surg* 206: 361–369.

Kapchuk TJ, Kelley JM, Conboy LA, Davis RB, Kerr CE, Jacobson EE, Kirsch I, Schyner RN, Nam BH, Nguyen LT, Park M, Rivers AL, McManus C, Kokkotou E, Drossman DA, Goldman P, Lembo AJ (2008): Components of placebo effect: Randomised controlled trial in patients with irritable bowel syndrome. *BMJ Res* 336.

Kapchuk TJ (2011): Placebo studies and ritual theory: a comparative analysis of Navajo, acupuncture and biomedical healing. *Philos Trans R Soc Lond B Biol Sci* 366.

Kayombo EJ, Uiso FC, Mbwambo ZH, Mahunnah RL, Moshi MJ, Mgonda YH (2007): Experience of initiating collaboration of traditional healers in managing HIV and AIDS in Tanzania. *Ethnobiol Ethnomed* 3.

Kiecolt-Glaser JK, McGuire L, Robles TF, Glaser R (2002): Psychoneuroimmunology and psychosomatic medicine: Back to the Future. *Psychosom Med* 64.

Kirchhoff P (1943): Mesoamérica, sus límites geográficos, composición étnica y caracteres culturales. *Acta Am* 1: 92–107.

Kleinman A (1975): Explanatory models in health care relationships. *Health Fam Natl Counc Int Health Symp*: 159–172.

Kleinman A (1978): Concepts and a model for the comparison of medical systems as cultural systems. *Soc Sci Med* 12: 85–93.

- Kleinman A (2011): Medicine's symbolic reality: On a central problem in the philosophy of medicine. In *A reader in medical anthropology: Theoretical trajectories, emergent realities*. Wiley-Blackwell, United States, pp. 85–90.
- Krütli P, Stauffacher M, Flüeler M, Scholz RW (2010): Functional-dynamic public participation in technological decision-making: Site selection processes of nuclear waste repositories. *Risk Res* 13 (7): 861–75.
- Kufer J, Förther H, Pöll E, Heinrich M (2005): Historical and modern medicinal plant uses: The example of the Ch'orti' Maya and Ladinos in eastern Guatemala. *Pharm Pharmacol* 57: 1127–1152.
- Langer E, Rodin J (1976): The effects of choice and enhanced personal responsibility for the aged: A field experiment in an institutional setting. *Pers Soc Psychol* 34: 191–198.
- Lee R, Balick MJ (2003): Stealing the soul, soumwahu en naniak, and susto: understanding culturally-specific illness, their origins and treatment. *Altern Ther Health Med* 9: 106–109.
- Lee RPL (1982): Comparative studies of health care systems. *Soc Sci Med* 16: 629–642.
- Leonti M, Vibrans H, Sticher O, Heinrich M (2001): Ethnopharmacology of the Popoluca, Mexico: An Evaluation. *Pharm Pharmacol* 53: 1653–1669.
- Linares E, Bye RA (1987): A study of four medicinal plant complexes of Mexico and adjacent United States. *Ethnopharmacol* 19: 153–83.
- Liverpool J, Alexander R, Johnson M, Ebba EK, Francis S, Liverpool C (2004): Western Medicine and Traditional Healers: Partners in the Fight Against HIV/AIDS. *Natl Med Assoc* 96: 822–825.
- Logan MH, Morrill WT (1979): Humoral medicine and informant variability : An analysis of acculturation and cognitive change among Guatemalan villagers. *Anthropos* 74 (5/6): 785–802.
- Lowenberg JS, Davis F (1994): Beyond medicalisation-demedicalisation: the case of holistic health. *Sociol Health Illn* 16: 579–599.
- Luber GE (1999): An explanatory model for the Maya ethnomedical syndrome Cha'lam tsots. *Ecol Anthropol* 3: 14–23.
- Luján J (1999): Historia general de Guatemala (various volumes). Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo, Guatemala C. A.
- Lutz CH (1994): Evolución demográfica de la población no indígena. In Luján Muñoz J, Aguilar EC (Eds.): *Historia General de Guatemala Vol. II: Dominación Española: Desde La Conquista Hasta 1700*, pp. 249–58. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.
- Madlener S, Svacinová J, Kitner M, Kopecky J, Eytner R, Lackner A, Nha V, Frisch R, Grusch M, De Martin R (2009): In Vitro Anti-Inflammatory and Anticancer Activities of Extracts of *Acalypha Alopecuroidea* (Euphorbiaceae). *Int Onc* 35 (4): 881–91.
- Mark GT, Lyons AC (2010): Maori healers' views on wellbeing: The importance of mind, body, spirit, family and land. *Soc Sci Med* 70: 1756–1764.
- Martin JF, Roy ED, Diemont SAW, Ferguson BG (2010): Traditional Ecological Knowledge (TEK): Ideas, inspiration, and designs for ecological engineering. *Ecol Eng* 36: 839–849.
- Martínez M (1990): Las plantas medicinales de México. Ediciones Botas, México, D.F.

Mathez-Stiefel S-L, Vandebroek I, Rist S (2012): Can Andean medicine coexist with biomedical healthcare? A comparison of two rural communities in Peru and Bolivia. *Ethnobiol Ethnomed* 8.

McCreery D (1995a): Agricultura. In Luján Muñoz J, Herrarte A (Eds.): *Historia General de Guatemala Vol. IV: Desde La República Federal Hasta 1898*, pp. 481–502. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.

McCreery D (1995b): El Café y sus efectos en la sociedad indígena. In Luján Muñoz J, Herrarte A (Eds.): *Historia General de Guatemala Vol. IV: Desde La República Federal Hasta 1898*, pp. 503–34. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.

McCullough EB, Matson PA (2010): Evolution of the knowledge system for agricultural development in the Yaqui Valley, Sonora, Mexico. *PNAS*.

McKee J (1988): Holistic health and the critique of western medicine. *Soc Sci Med* 26: 775–784.

Michel J, Duarte RE, Bolton JL, Huang Y, Cáceres A, Veliz M, Soejarto DD, Mahady GB (2007): Medical Potential of Plants Used by the Q'eqchi Maya of Livingston, Guatemala for the Treatment of Women's Health Complaints. *Ethnopharmacol* 114: 92–101.

Micozzi MS (2006a): Characteristics of Complementary and Alternative Medicine. In Micozzi MS (Ed.): *Fundamentals of Complementary and Alternative Medicine*. Saunders, Elsevier, San Louis, Missouri, pp. 1–8.

Micozzi MS (2006b): Translation from Conventional Medicine. In Micozzi MS (Ed.): *Fundamentals of Complementary and Alternative Medicine*. Saunders, Elsevier, San Louis, Missouri, pp. 9–16.

Micozzi MS (2006c): *Fundamentals of Complementary and Alternative Medicine*. Saunders, Elsevier, Westport, Connecticut.

Mignone J, Bartlett J, O'Neil J, Orchard T (2007): Best practices in intercultural health: five case studies in Latin America. *Ethnobiol Ethnomed* 3.

Missouri Botanical Garden (2015): Flora Mesoamericana. <http://www.tropicos.org/ProjectAdvSearch.aspx?projectid=3&langid=66> (accessed: Sep. 22, 2015).

Moerman DE, Jonas WB (2002): Deconstructing the placebo effect and finding the meaning response. *Am Coll Physicians–American Soc Intern Med* 136.

Moerman DE (2013): Against the “placebo effect”: A personal point of view. *Complement Ther Med* 21: 125–130.

Molesky-Poz J (2006): *Contemporary Maya spirituality: the ancient ways are not lost*. University of Texas Press, Austin.

Montellano BO de (1975): Empirical Aztec Medicine. *Science* 188: 215–220.

Moscovici S (1984): The phenomenon of social representations. In Moscovici S, Farr R (Eds.): *Social Representations*. Cambridge University Pres, Cambridge, UK.

Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J (2000): Biodiversity hotspots for conservation priorities. *Nature* 403: 853–58.

- Nesheim I, Dhillon SS, Stølen KA (2006): What happens to traditional knowledge and use of natural resources when people migrate? *Human Ecology* 34 (1): 99–131.
- Niemeyer K, Bell IR, Koithan M (2013): Traditional knowledge of Western herbal medicine and complex systems science. *Herb Med* 3: 112–119.
- Nigenda G, Mora Flores G, Adama López S, Orozco Nuñez E (2001): La práctica de la medicina tradicional en América Latina y el Caribe: el dilema entre regulación y tolerancia. *Salud Pública México* 43: 41–51.
- Orellana SL (1987): *Indian medicine in highland Guatemala: the pre-Hispanic and colonial periods*. University of New Mexico Press, Albuquerque.
- PAHO (2007): *Health systems profile Guatemala* (No. NLM WA 525). Pan American Health Organization, Washington D.C.
- Patwardhan B, Mashelkar RA (2009): Traditional medicine-inspired approaches to drug discovery: can Ayurveda show the way forward? *Drug Discov. Today*.
- Pedersen D, Baruffati V (1985): Health and traditional medicine cultures in Latin America and the Caribbean. *Soc Sci Med* 21: 5–12.
- Pedersen D, Baruffati V (1989): Healers, Deities, Saints and Doctors: Elements for the Analysis of Medical Systems. *Soc Sci Med* 29: 487–496.
- Pesek T, Abramiuk M, Fini N, Rojas MO, Collins S, Cal V, Sanchez P, Poveda L, Arnason J (2010): Q'eqchi' Maya healers' traditional knowledge in prioritizing conservation of medicinal plants: Culturally relative conservation in sustaining traditional holistic health promotion. *Biodiv Conserv* 19: 1–20.
- Pohl C, Hirsch Hadorn G (2007): *Principles for designing transdisciplinary research. Proposed by the Swiss Academies of Arts and Sciences*. Munich: Oekom Verlag.
- Pohl C, Rist S, Zimmermann A, Fry P, Gurung GS, Schneider F, Speranza CI (2010): Researchers' roles in knowledge co-production: Experience from sustainability research in Kenya, Switzerland, Bolivia and Nepal. *Sc Pub Pol* 37 (4): 267–81.
- Pöll E, Mejía C, Szejner M (1995): *Etnobotánica Garífuna: Livingston, Izabal, Guatemala*. Guatemala City: Universidad del Valle de Guatemala.
- Press I (1975): *Tradition and adaptation: life in a modern Yucatan Maya village*. Greenwood Press, Westport, Conn.
- R Core Team (2015): *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Rappaport R (1979): *Ecology, meaning and religion*. Richmond: North Atlantic Books.
- Recinos A (2008): *El Popol Vuj: Las antiguas historias del Quiché*. Berbera Editores, México, D.F.
- Rhodes LA (1996): Studying biomedicine as a cultural system. In Sargent CF, Johnson TM (Eds.): *Handbook of Medical Anthropology: Contemporary Theory and Method*. Greenwood Press, Westport, Connecticut, pp. 165–180.
- Richards M, Richards J (1994): Lenguas indígenas y procesos lingüísticos. In Luján Muñoz J, Aguilar EC (Eds.): *Historia General de Guatemala Vol. II: Dominación Española: Desde La Conquista Hasta 1700*, pp. 345–60. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.

- Riera RP (1997): Infraestructura, comercio, y servicios públicos. In Luján Muñoz J, Contreras JD (Eds.): *Historia General de Guatemala Vol. VI: Época Contemporánea: De 1945 a La Actualidad*, pp. 431–50. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.
- Roque JM (1941): *Flora Medicoguatemalteca: Apuntes para la materia médica de la república de Guatemala*. Guatemala City.
- Roys RL (1931): *The Ethno-botany of the Maya*. Tulane University Press, Luisiana.
- Sahagún FB de (2012): *Florentine Codex: General history of the things of New Spain*. University of Utah Press, Salt Lake City, Utah.
- Saint-Lu A (1994): La Verapaz. In Luján Muñoz J, Aguilar EC (Eds.): *Historia General de Guatemala Vol. II: Dominación Española: Desde La Conquista Hasta 1700*, pp. 627–40. Guatemala City: Asociación de Amigos del País. Fundación para la Cultura y el Desarrollo.
- Schwartz NB (1990): *Forest society: A social history of Peten, Guatemala*. Pennsylvania: University of Pennsylvania Press.
- Shankar D (2010): Conceptual framework for new models of integrative medicine. *Ayurveda Integr Med* 1.
- Shroff FM (2011): Conceptualizing holism in international interdisciplinary critical perspective: Toward a framework for understanding holistic health. *Soc Theory Health* 9: 244–255.
- Spelman K (2006): *Ecological Pharmacy: From Gaia to Pharmacology*. In Micozzi MS (Ed.): *Fundamentals of Complementary and Alternative Medicine*. Saunders, Elsevier, San Louis, Missouri.
- Staiano KV (1981): Alternative therapeutic systems in Belize: A semiotic framework. *Soc Sci Med* 158: 317–332.
- Star S, Griesemer JR (1989): Institutional ecology, translations' and boundary objects: Amateurs and professionals in Berkeley's Museum of Vertebrate Zoology. *Soc Stud Sci* 19: 387–420.
- Staub PO, Geck MS, Weckerle CS, Casu L, Leonti M (2015): Classifying diseases and remedies in ethnomedicine and ethnopharmacology. *Ethnopharmacol* 174: 514–19.
- Stauffacher M, Flüeler T, Krütli P, Scholz RW (2008): Analytic and dynamic approach to collaboration: A transdisciplinary case study on sustainable landscape development in a Swiss Prealpine Region. *Systemic Practice Action Res* 21 (6): 409–22.
- Sudhinaraset M, Ingram M, Lofthouse HK, Montagu D (2013): What is the role of informal healthcare providers in developing countries? A systematic review. *Plos One* 8.
- Szawarska D (2015): Curing and healing: Two goals of medicine. In Schramme T, Edwards S (Eds.): *Handbook of the Philosophy of Medicine*. Springer, Dordrecht; London.
- Taquirá S, Cab Kim HR, López Ixcoy JM, Ixcoy Tavico EL, López Ordóñez RL, Asij Cajbón NA, Berger-González M (2016): Raxnaq'il Nuk' aslemal: Principios básicos sobre el bienestar par comprender la Medicina Maya'. In Consejo Mayor de Ancianos Mayas Médicos por Nacimiento (Ed.): *Raxnaq'il Nuk'aslemal: Medicina Maya rn Guatemala*. Cholsamaj, Guatemala [City], pp. 51–80.

- Tedlock B (1992): Time and the highland Maya. University of New Mexico Press, Albuquerque.
- The Plant List (2013): The Plant List, Version 1.1. www.theplantlist.org (accessed: July 15, 2016).
- Trotter R, Logan M (1986): Informant consensus: A new approach for identifying potentially effective medicinal plants. In Etkin NL (Ed.): *Plants in Indigenous Medicine and Diet: Biobehavioural Approaches*. Bedford Hills, New York: Redgrave.
- UNAIDS (2000): Collaboration with traditional healers in HIV/AIDS prevention and care in sub-Saharan Africa: A literature review (No. UNAIDS/00.29E). UNAIDS, Geneva, Switzerland.
- UNAIDS (2006): Collaborating with traditional healers for HIV prevention and care in sub-Saharan Africa: practical guidelines for programmes (No. UNAIDS/06.28E). UNAIDS, Geneva, Switzerland.
- Vandebroek I (2013): Intercultural health and ethnobotany: How to improve health care for underserved and minority communities? *Ethnopharmacol* 148: 746–754.
- Verhoef MJ, Lewith G, Ritenbaugh C, Boon H, Fleishman S, Leis A (2005): Complementary and alternative medicine whole systems research: Beyond identification of inadequacies of the RCT. *Complement. Ther Med* 13: 206–212.
- Verpoorte R, Choi YH, Kim HK (2005): Ethnopharmacology and systems biology: A perfect holistic match. *Ethnopharmacol* 100.
- Victoria CG, Habicht J-P, Bryce J (2004): Evidence-based public health: Moving beyond randomized trials. *Am Public Health* 94: 400–405.
- Vides-Porras A (2016): “Nos curamos juntos”: La importancia de las relaciones terapéuticas en la Medicina Maya. In Consejo Mayor de Ancianos Mayas Médicos por Nacimiento (Ed.): *Raxnaq’il Nuk’aslemal: Medicina Maya En Guatemala*. Cholsamaj, Guatemala [City].
- Villamar A, Asseleih LM, Rodarte ME (Eds., 1994): Atlas de las plantas medicinales de la Medicina Tradicional Mexicana. Instituto Nacional Indigenista, Mexico, D.F.
- Villar-Anleu (1998): La Flora Silvestre de Guatemala. Guatemala City: USAC.
- Villatoro E (2001): Conociendo la medicina Maya en Guatemala: Módulo de sensibilización, programa nacional de medicina popular tradicional y alternativa. Ministerio de Salud Pública y Asistencia Social.
- Waldram JB (2000): The efficacy of traditional medicine: Current theoretical and methodological issues. *Med Anthropol Q* 14: 603–625.
- Willcox ML, Bodeker G (2004): Traditional herbal medicines for malaria. *BMJ* 329: 1156–1159.
- Willcox ML (2011): Improved traditional phytomedicines in current use for the clinical treatment of Malaria. *Planta Med* 77: 662–671.
- Willcox ML, Graz B, Falquet J, Diakite C, Giani S, Diallo D (2011): A “reverse pharmacology” approach for developing an anti-malarial phytomedicine. *Malar* 10.
- Williams G (1984): The genesis of chronic illness: narrative re-construction. *Sociol Health Illn* 6.

Williams A (1998): Therapeutic landscapes in holistic medicine. *Soc Sci Med* 46: 1193–1203.

World Health Organization (1978): Report of the International Conference on Primary Health Care. World Health Organization, Alma-Ata.

World Health Organization (2013): WHO traditional medicine strategy, 2014-2023. World Health Organization, Geneva.

World Health Organization (2015): International Statistical Classification of Diseases and Related Health Problems 10th Revision.

<http://apps.who.int/classifications/icd10/browse/2015/en> (accessed: Feb. 3, 2016).

World Health Organization (2016): Traditional Medicine: Definitions [WWW Document]. URL <http://www.who.int/medicines/areas/traditional/definitions/en/> (accessed 4.25.16).

Young JC (1981): *Medical choice in a Mexican village*. Rutgers University Press, New Brunswick, New York

Appendix: Voucher Collection

This table presents a full list of identified use reports. Botanical nomenclature is validated with The Plant List (The Plant List 2013). Voucher numbers are given in the column 'source'. If identified by vouchers of other healers during validation workshops this is indicated by (VW). If identified from literature this is indicated as (L). Vouchers that were not given a number by the Herbarium are indicated as SN. Phytogeographic origin (O): N = native, I = introduced (according to Cáceres 2009, Missouri Botanical Garden 2015). Linguistic group (G): Q'eqchi' (Q), Kaqchikel (K).

Translated use concepts are tentative and only for illustration of the range of reported applications. They are neither aiming for complete representation of source information, nor are the terms medically or linguistically corroborated. Use classification derived from the ICD-10 (World Health Organization 2015):

M = Musculoskeletal System

C = Circulatory System

B = Blood, Immune & Endocrine System

P = Respiratory System

D = Digestive System

U = Urinary System

R = Reproductive System

T = Tissue Problems & Infections

B = Central Nervous System and Behavioral Syndromes

S = Spiritual-Energetic Uses

O = Other.

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Acanthaceae	<i>Aphelandra heydeana</i> Donn.Sm.	18037	-	Q	Snake bites											1
Acanthaceae	<i>Aphelandra scabra</i> (Vahl) Sm.	18240	-	Q	Menstruation problems, urinary or prostate infections						1	1				
Acanthaceae	<i>Aphelandra scabra</i> (Vahl) Sm.	18262	-	Q	High blood pressure, body pain, bone pain, headache	1	1							1		
Acanthaceae	<i>Aphelandra scabra</i> (Vahl) Sm.	18038	-	Q	Snake bites											1
Acanthaceae	<i>Aphelandra scabra</i> (Vahl) Sm.	17882	-	Q	High fever							1				1
Acanthaceae	<i>Bravaisia berlandieriana</i> (Nees) T.F.Daniel	18088	-	Q	Saturations, headache due to family issues									1	1	
Acanthaceae	<i>Dicliptera sp.</i>	18035	-	Q	Fever											1
Acanthaceae	<i>Hygrophila sp.</i>	18455	-	Q	Black magic, itching in all the body	1									1	
Acanthaceae	<i>Justicia breviflora</i> (Nees) Rusby	18287	-	Q	Parasites					1						
Acanthaceae	<i>Justicia campechiana</i> Standl. ex Lundell	18109	-	Q	Colic, gastritis, sudden death - 'muerte repentina'					1				1		
Acanthaceae	<i>Justicia macrantha</i> Benth.	17924	-	K	Skin problems: 'awuas'								1			
Acanthaceae	<i>Justicia sp.</i>	18394	-	K	Diabetes			1								
Acanthaceae	<i>Louteridium donnell-smithii</i> S.Watson	18256	-	Q	Constipation, tonic			1		1						
Acanthaceae	<i>Odontonema albiflorum</i> Leonard	18092	-	Q	Body pain, epilepsy									1		
Acanthaceae	<i>Odontonema callistachyum</i> (Schltdl. & Cham.) Kuntze	18110, 18083	-	Q	Epilepsy, fever, saturations, spiritual cleansing									1	1	1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Acanthaceae	<i>Odontonema callistachyum</i> (Schltdl. & Cham.) Kuntze	18253	-	Q	Itching' in the bones, body pain	1								1		
Acanthaceae	<i>Sanchezia parvibracteata</i> Sprague & Hutch.	18396	-	K	Arthritis	1										
Acanthaceae	<i>Sanchezia parvibracteata</i> Sprague & Hutch.	17982 (VW)	-	Q	Poisons, dying tissue								1			1
Acanthaceae	<i>Sanchezia parvibracteata</i> Sprague & Hutch.	17982	-	Q	Itching in bones and body	1								1		
Acanthaceae	<i>Thunbergia mysorensis</i> (Wight) T.Anderson	18075	-	K	cancer, arthritis, nerves, infections of the skin, veins	1	1						1	1		
Acanthaceae		18178	-	Q	Analgesic, tonic			1						1		
Actinidiaceae	<i>Saurauia oreophila</i> Hemsl.	18390	N	K	Nervous system, blood purification, strengthen immune system, arthritis, diabetes, hepatitis, varicose veins, uric acid, cholesterol, nose bleeding, bilis, liver, kidneys, pulmonary infections	1	1	1	1	1	1			1		
Adoxaceae	<i>Sambucus canadensis</i> L.	17984	N	K	Gastritis, ulcers, prostate, inflammations, infections, urinary problems, blood purification, sweating, expectorant, respiratory problems, white vaginal flux			1	1	1	1	1	1			1
Adoxaceae	<i>Sambucus canadensis</i> L.	17772	N	K	Blood purification, diuretic, analgesic, stimulating immune system, tonic			1			1			1		
Adoxaceae	<i>Sambucus canadensis</i> L.	18143	N	K	Skin infections: 'granos', lungs, cough, uric acid, cholesterol, allergies			1	1		1		1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Alstroemeriaceae	<i>Bomarea acutifolia</i> (Link & Otto) Herb.	18194	N	K	Destroys kidney & gallbladder stones, desinflammation of kidney and biliary system, liver, stomach					1	1					
Alstroemeriaceae	<i>Bomarea edulis</i> (Tussac) Herb.	18250	N	Q	Stomach cancer, 'dries' tumors, snake bites, skin problems - 'mai'								1			1
Amaranthaceae	<i>Amaranthus hybridus</i> L.	17911	-	K	Increase numbers of erythrophytes			1								
Amaranthaceae	<i>Beta vulgaris</i> L.	L	-	K	Desinflammant, ulcers, lesions, 'granos', abscesses, nerves, strenghten the blood	1		1					1	1		
Amaranthaceae	<i>Celosia argentea</i> L.	18449	-	Q	Anemia			1								
Amaranthaceae	<i>Chenopodium berlandieri</i> Moq.	17968	-	K	Stenghten the blood, tonic			1								
Amaranthaceae	<i>Chenopodium berlandieri</i> Moq.	17968 (VW)	-	K	Tonic, inflammations, purification, diuretic			1			1		1			
Amaranthaceae	<i>Chenopodium berlandieri</i> Moq.	17968 (VW)	-	K	Tonic			1								
Amaranthaceae	<i>Chenopodium murale</i> L.	17779	-	K	Purification, stimulating immune system, cough, saturations			1	1						1	
Amaranthaceae	<i>Chenopodium murale</i> L.	17779 (VW)	-	K	Cysts, ulcers, tumors, cancer, skin infections								1	1		
Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	17817, 18296	N	K	Antibiotic, wound healing, inflamations, uterine cysts							1	1			
Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	17975	N	K	Cough, post-delivery care, parasites, menstruation, stomach problems, respiratory problems, shivering, influenza, fever, parasites				1	1		1				1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	17777	N	K	Wound healing, blood purification, parasites, headache, stomach ache			1		1			1	1		
Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	17817, 18296, 17975, 17777 (VW)	N	K	Digestive, cleaning wounds, ulcers, cysts, wound healing, tumors, cancer, skin infections					1			1			
Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	18331	N	Q	Parasites, menstruation, diarrhea, vomiting					1		1				
Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	18331 (VW)	N	Q	Purgative					1						
Amaranthaceae	<i>Gomphrena globosa</i> L.	18388	-	K	Stop hemorrhagias, relaxative			1						1		
Amaranthaceae	<i>Gomphrena globosa</i> L.	17898	-	K	Abortive							1				
Amaranthaceae	<i>Gomphrena globosa</i> L.	18388, 17898 (VW)	-	K												
Amaranthaceae	<i>Gomphrena globosa</i> L.	18445	-	Q	Cholera					1						
Amaryllidaceae	<i>Allium cepa</i> L.	L	I	K	Organ stimulation, parasites			1		1						
Amaryllidaceae	<i>Allium cepa</i> L.	L	I	Q	Lungs, pneumonia, body pain	1			1							
Amaryllidaceae	<i>Allium sativum</i> L.	L	I	K	Parasites, control blood pressure		1			1						
Amaryllidaceae	<i>Allium sativum</i> L.	L	I	K	Parasites, blood purification, organ stimulation, expectorant			1	1	1						
Amaryllidaceae	<i>Allium sativum</i> L.	L	I	Q	Lungs, pneumonia, body, pain, snake bites, black magic	1			1						1	1
Amaryllidaceae	<i>Zephyranthes brevipes</i> Standl.	18162	-	K	Supernatural problems, ulcers, hernias, cysts, tumors, kidney stones, diabetes, cancer, sacred			1		1	1		1		1	
Anacardiaceae	<i>Mangifera indica</i> L.	17888	-	K	Cough, chills, sweating, respiratory problems, influenza, parasites				1	1		1				1
Anacardiaceae	<i>Mangifera indica</i> L.	18447	-	Q	Pneumonia					1						

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Anacardiaceae	<i>Rhus terebinthifolia</i> Schltl. & Cham.	18072	-	K	Wound healing, skin problems: 'granos', strenghtens brain								1	1		
Anacardiaceae	<i>Rhus terebinthifolia</i> Schltl. & Cham.	17796	-	K	Wound healing, blood purification, allergies of skin, osteoroposis	1		1					1			
Anacardiaceae	<i>Rhus terebinthifolia</i> Schltl. & Cham.	17999	-	K	Allergies, blood purification, headache			1						1		
Anacardiaceae	<i>Rhus terebinthifolia</i> Schltl. & Cham.	18060	-	Q	Parasites, purgative, vomiting, diarrhea					1						
Anacardiaceae	<i>Spondias purpurea</i> L.	18117	-	K	Antibiotic, inflammations, kills bad cells in the blood								1			
Anacardiaceae	<i>Spondias purpurea</i> L.	18117 (VW)	-	K	Diarrhea, digestion, skin issues, tranquilizing, uric acid					1	1		1	1		
Annonaceae	<i>Annona cherimola</i> Mill.	18191 (VW)	-	K	Expectorant, purification, deinflamant			1	1				1			
Annonaceae	<i>Annona cherimola</i> Mill.	18191	-	K	Rheumatism, fractures, muscular tissue, destroys kidney & gall bladder stones, small nerves, lesions	1	1				1			1		
Apiaceae	<i>Anethum graveolens</i> L.	L	I	K	Astringent, Blood fluxes - stop bleedings, nerve pains, stomach pains, colon pains											
Apiaceae	<i>Anethum graveolens</i> L.	L	I	K	Stomach problems, nerves, some infections and cysts, spice			1		1		1	1	1		
Apiaceae	<i>Angelica mexicana</i> Vatke	17795	-	K	Analgesic, stomach problems, purification			1		1			1	1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Apiaceae	<i>Angelica mexicana</i> Vatke	18027	-	K	Nerves, infections, cysts, spice, arthritis, arteriosclerosis, sleeplessness, varicose veins, ceremonies	1	1							1		
Apiaceae	<i>Apium graveolens</i> L.	L	I	K	Decrease weight, reduce adipose tissue			1								
Apiaceae	<i>Apium graveolens</i> L.	L	I	K	Nervous problems									1		
Apiaceae	<i>Arracacia bracteata</i> Coult & Rose	17786	N	K	Nerves, depression, brain paralysis, brain hemorrhages, migraine, blood circulation		1							1		
Apiaceae	<i>Coriandrum sativum</i> L.	17918	I	K	Loosing weight			1								
Apiaceae	<i>Coriandrum sativum</i> L.	17918 (VW)	I	K	Nerves, stomach ache, tonic			1		1				1		
Apiaceae	<i>Coriandrum sativum</i> L.	17918 (VW)	I	Q	Pneumonia, body pain	1			1							
Apiaceae	<i>Cuminum cyminum</i> L.	L	-	K	Nervous pains, stomach pains					1				1		
Apiaceae	<i>Daucus carota</i> L.	L	I	K	Problems of eye view, nervous problems, stomach ache, wound healing, fractures, lesions due to hits	1				1			1	1		1
Apiaceae	<i>Eryngium cymosum</i> F.Delaroche	17939	-	K	Inflammations, wound healing, blood purification, arthritis	1		1					1			
Apiaceae	<i>Eryngium foetidum</i> L.	18190	I	K	Uterus, menstruation, cysts, ovaries, ulcers, tumors, hernias, cancer, prostate							1	1			
Apiaceae	<i>Foeniculum vulgare</i> Mill.	17752	I	K	Blood purification, digestive, stimulate maternal milk			1		1		1				
Apiaceae	<i>Foeniculum vulgare</i> Mill.	17752 (VW)	I	K	Stomach problems, inflammations of intestines, cysts, prostate, bilis, stimulating appetite, pancreas, pulmonary problems			1	1	1		1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Apiaceae	<i>Myrrhis odorata</i> (L.) Scop.	L	-	K	Sacred, colon, intestinal inflammations					1					1	
Apiaceae	<i>Myrrhis odorata</i> (L.) Scop.	L	-	K	Analgesic, expectorant, stimulating immune system			1	1					1		
Apiaceae	<i>Pimpinella anisum</i> L.	L	I	K	Alcoholism, stimulates delivery contractions, antibiotic							1				1
Apiaceae	<i>Pimpinella anisum</i> L.	L	I	K	Facilitate delivery, children that cry a lot, arthritis, cramps, nervous excitation, epilepsy, uterus, bilis, urinary problems, tonic, analgesic	1		1		1	1	1		1		1
Apiaceae	<i>Pimpinella anisum</i> L.	L	I	K												
Apocynaceae	<i>Asclepias curassavica</i> L.	18472	N	Q	Itching, swellings with pus, skin problems: 'nacidós', constipation					1			1			
Apocynaceae	<i>Asclepias curassavica</i> L.	18316	N	Q	Parasites					1						
Apocynaceae	<i>Pentalinon andrieuxii</i> (Müll.Arg.) B.F.Hansen & Wunderlin	17841	N	Q	Diabetes			1								
Apocynaceae	<i>Thevetia ahouai</i> (L.) A.DC.	18229	N	Q	Itching								1			
Apocynaceae	<i>Thevetia ahouai</i> (L.) A.DC.	18091	N	Q	Parasites, itching, wounds					1			1			
Apocynaceae	<i>Thevetia ahouai</i> (L.) A.DC.	18365	N	Q	Ulcers, antibiotic, leishmaniosis - 'mosca chiclera', tumors								1			
Apocynaceae	<i>Tonduzia stenophylla</i> (Donn.Sm.) Pittier	18465	-	Q	Snakebites											1
Apocynaceae	<i>Tonduzia stenophylla</i> (Donn.Sm.) Pittier	18465 (VW)	-	Q	Vomiting blood, allergies			1		1						
Apocynaceae	<i>Vinca major</i> L.	17750	I	K	Blood purification, cardiotoxic, analgesic, inflammations, diuretic, rubefacient, tumors		1	1		1	1		1	1		

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Araceae	<i>Anthurium schlechtendalli</i> Kunth	18215	- Q	Craziness, calm down excited minds									1		
Araceae	<i>Anthurium schlechtendalli</i> Kunth	18215 (VW)	- Q	Syncopes, 'tzuul', ceremonial									1	1	
Araceae	<i>Anthurium schlechtendalli</i> Kunth	18215 (VW)	- Q	Craziness ue to seeing bad spirits									1	1	
Araceae	<i>Anthurium sp.</i>	17909	- Q	High blood pressure		1									
Araceae	<i>Colocasia esculenta</i> (L.) Schott	L	- K	Nutrition											1
Araceae	<i>Philodendron guttiferum</i> Kunth	17834	- Q	Strokes, nervous system									1		
Araceae	<i>Philodendron guttiferum</i> Kunth	18408, 18479	- Q	Burning' sensation in feet, 'itching' in the blood, body and bones	1		1								
Araceae	<i>Scindapsus pictus</i> Hassk.	18410	- Q	Headache, ulcers, craziness								1	1		
Araceae	<i>Spathiphyllum blandum</i> Schott	18305	- Q	Uterus							1				
Araceae	<i>Spathiphyllum blandum</i> Schott	17907	- Q	Cramps	1										
Araceae	<i>Syngonium podophyllum</i> Schott	17862, 17835, 18325 (VW)	- Q	Attacks									1		
Araceae	<i>Syngonium podophyllum</i> Schott	17835, 18325	- Q	Poisons, wounds, 'granos', swellings								1			1
Araceae	<i>Syngonium podophyllum</i> Schott	17862	- Q	Sudden death', epilepsy, poisons									1		1
Araceae	<i>Syngonium sp.</i>	18407	- Q	Attacks									1		
Araceae	<i>Xanthosoma robustum</i> Schott	SN	- Q	Wound healing, blood coagulation			1					1			
Areaceae	<i>Chamaedorea sp.</i>	18064	- K	Diabetes, amoebas, ulcers			1		1			1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Arecaceae	<i>Chamaedorea sp.</i>	18119	-	K	Wound healing, blood sugar level			1					1			
Arecaceae	<i>Chamaedorea sp.</i>	17899	-	K	Strengthen erythrocytes, cough, enhance fertility			1	1			1				
Arecaceae	<i>Cocos nucifera</i> L.	L	-	K	Strengthen uterus, urinary infections						1	1				
Arecaceae	<i>Cocos nucifera</i> L.	L	-	K	Diuretic, prostate problems, kidney and bladder infections, parasites, dysentery					1	1	1				
Aristolochiaceae	<i>Aristolochia pilosa</i> Kunth	18277	N	Q	Craziness									1		
Aristolochiaceae	<i>Aristolochia sp.</i>	18174	-	Q	Cancer, sexual shocks - 'susto sexual', pain - 'mai'								1	1		
Aristolochiaceae	<i>Aristolochia sp.</i>	18342	-	Q	Chronic attacks									1		
Aristolochiaceae	<i>Aristolochia sp.</i>	18174 (VW)	-	Q	Swellings with pus								1			
Asparagaceae	<i>Agave tecta</i> Trelease	17815	N	K	Wound healing, diuretic						1		1			
Asparagaceae	<i>Agave tecta</i> Trelease	17815 (VW)	N	K	Gastritis, cysts, tumors, ulcers, reproduces defenses, nerves, rich in proteins, wound healing			1		1			1	1		
Asparagaceae	<i>Maianthemum flexuosum</i> (Bertol.) LaFrankie	17803, 17949	N	K	Cardiotonic, diuretic, purification, heart problems, water retention in tissues		1	1			1					
Asparagaceae	<i>Milla biflora</i> Cav.	18074	N	K	Diuretic, nervous system						1			1		
Asparagaceae	<i>Sansevieria trifasciata</i> Prain	17806	I	K	Cleaning wounds, allergies due to insect bites, wound healing, lesions	1		1					1			
Asparagaceae	<i>Yucca gigantea</i> Lem.	18107	N	K	Blood sugar level			1								
Asparagaceae	<i>Yucca gigantea</i> Lem.	18107 (VW)	N	K	Tonic, bronchitis, pain in the ears and the body			1	1					1		1
Asparagaceae	<i>Yucca gigantea</i> Lem.	18107 (VW)	N	K	Impotence, analgesic, inflammations							1	1	1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Begoniaceae	<i>Begonia heracleifolia</i> Cham. & Schltldl.	18261	N	Q	Desinflammant, infections, dermatophytes, coloured 'granos' in the skin, prostate infection, itching in the skin, urinary infection						1		1			
Begoniaceae	<i>Begonia heracleifolia</i> Cham. & Schltldl.	18052, 18291	N	Q	Granos' in blood capillaries and in the skin, mental problems, menstruation, pains		1					1	1	1		
Begoniaceae	<i>Begonia nelumbiifolia</i> Cham. & Schltldl.	18258	N	Q	Athlete's foot, itching								1			
Begoniaceae	<i>Begonia nelumbiifolia</i> Cham. & Schltldl.	18290	N	Q	Foot pain, 'itching' bones	1										
Begoniaceae	<i>Begonia sp.</i>	18218	-	Q	Skin cancer, pain - 'mai'								1			
Begoniaceae	<i>Begonia sp.</i>	18036	-	Q	Pain during urination, skin problems: 'nacios'						1		1			
Begoniaceae	<i>Begonia sp.</i>	18036	-	Q	Ulcers caused by fungi								1			
Betulaceae	<i>Alnus acuminata</i> sbsp. <i>arguta</i> (Schltldl.) Furlow	17953	N	K	Inflammations of kidneys and liver, allergies, colon, gastritis, fever, white vaginal flux, infections, swellings, colesterol, uric acid			1		1	1	1	1			
Betulaceae	<i>Alnus acuminata</i> sbsp. <i>arguta</i> (Schltldl.) Furlow	17760	N	K	Blood purification			1								
Betulaceae	<i>Alnus jorullensis</i> Kunth	17738	N	K	Blood purification			1								
Betulaceae	<i>Alnus sp.</i>	17738, 17760 (VW)	-	K	Destroy tossue - 'masas', antibiotic, allergies, skin problems: 'granos'								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Bixaceae	<i>Bixa orellana</i> L.	18056, 18205 (VW)	N	Q	Dysentery					1						
Bixaceae	<i>Bixa orellana</i> L.	18056	N	Q	Hepatitis					1						
Bixaceae	<i>Bixa orellana</i> L.	18205	N	Q	Dysentery, female hemorrhages, diarrhea, normalizes blood					1	1					
Boraginaceae	<i>Borago officinalis</i> L.	17771	I	K	Analgesic, cough, fever, purification, cleanses blood, stimulates milk			1	1			1		1		1
Boraginaceae	<i>Bourreria mollis</i> Standl.	SN	N	Q	Diabetes			1								
Boraginaceae	<i>Heliotropium indicum</i> L.	18446	N	Q	Kidney pain						1					
Boraginaceae	<i>Lithospermum</i> sp.	18350	-	K	Expectorant, flatulence				1	1						
Boraginaceae	<i>Phacelia platycarpa</i> (Cav.) Spreng.	18157	N	K	Nerves, gastritis, uric acid, varicose veins, blood circulation, constipation	1				1	1			1		
Boraginaceae	<i>Wigandia urens</i> (Ruiz & Pav.) Kunth	17921, 18121	N	K	Abortive							1				
Boraginaceae	<i>Wigandia urens</i> (Ruiz & Pav.) Kunth	17790, 17926	N	K	Blood purification, infections, epilepsy, psychological, skin & immunological problems			1					1	1		
Brassicaceae	<i>Brassica oleracea</i> L.	17825, 17827	I	K	Desinflammant, diuretic						1		1			
Brassicaceae	<i>Brassica oleracea</i> L.	L	I	K	Cancer								1			
Brassicaceae	<i>Brassica rapa</i> L.	17768	I	K	Wound healing, desinflammant, cleanses tissue surfaces					1			1			
Brassicaceae	<i>Brassica rapa</i> L.	17768 (VW)	I	K	Stomach problems					1						
Brassicaceae	<i>Capsella bursa-pastoris</i> (L.) Medik.	17947	I	K	Inflammations, hemorrhages, wound healing			1					1			
Brassicaceae	<i>Capsella bursa-pastoris</i> (L.) Medik.	18137	I	K	Uterus, menstrual problems, ovarian cysts, destroys stones, ulcers						1	1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Brassicaceae	<i>Lepidium virginicum</i> L.	18106	I	K	Inflammations, analgesic, burnings, strengthen the brain, bone ache	1							1	1		
Brassicaceae	<i>Lepidium virginicum</i> L.	17967	I	K	Cough, nerves, influenza, fever, menstruation				1			1		1		1
Brassicaceae	<i>Lepidium virginicum</i> L.	17759	I	K	Purification, fever, expectorant, stomach, reduce blood sugar level			1	1	1						1
Brassicaceae	<i>Lepidium virginicum</i> L.	17996	I	K	Kidney & bladder stones, liver, kidneys					1	1					
Brassicaceae	<i>Raphanus raphanistrum</i> subsp. <i>sativus</i> (L.) Domin	L	I	K	Uric acid, blood purification, tonic, strengthen the blood, diuretic, prostate, water retention in tissues, kidney & bladder infections, stomach issues			1		1	1	1				1
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	L	I	K	Purgative					1						
Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	L	I	K	Kidney and gall bladder stones, purgative, parasites	1				1	1					
Bromeliaceae	<i>Pitcairnia punicea</i> Scheidw.	18337	N	Q	Tuberculosis				1							
Bromeliaceae	<i>Tillandsia</i> sp.	18131	-	Q	Itching								1			
Burseraceae	<i>Bursera simaruba</i> (L.) Sarg.	17958	N	K	Influenza, shivering, lesions due to hits	1			1							
Burseraceae	<i>Bursera simaruba</i> (L.) Sarg.	17958 (VW)	N	K	Stimulates immune system, gives fever & sweating, diuretic, purification			1			1					1
Burseraceae	<i>Bursera simaruba</i> (L.) Sarg.	17958 (VW)	N	Q	Diabetes, bone ache	1		1								
Burseraceae	<i>Bursera simaruba</i> (L.) Sarg.	SN	N	Q	Bone ache, body ache	1								1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Burseraceae	<i>Bursera simaruba</i> (L.) Sarg.	17958 (VW)	N	Q	Uterine or intestinal pain, headache, bone ache, blood problems, skin problems	1		1				1	1	1		
Buxaceae	<i>Buxus sempervirens</i> L.	17774	-	K	Analgesic, expectorant, purification, cough, saturations			1	1					1	1	
Cactaceae	<i>Acanthocereus tetragonus</i> (L.) Hummelinck	18096	N	K	Relaxant									1		
Cactaceae	<i>Epiphyllum hookeri</i> Haw.	17837, 18289 (VW)	N	Q	Fractures	1										
Cactaceae	<i>Epiphyllum hookeri</i> Haw.	17837	N	Q	Fractures, bone issues, dislocations	1										
Cactaceae	<i>Epiphyllum hookeri</i> Haw.	18289	N	Q	Fractures, back pain, dislocations	1										
Cactaceae	<i>Hylocereus undatus</i> (Haw.) Britton & Rose	18122	N	K	Inflammations, relaxative, balance hormones			1					1	1		
Cactaceae	<i>Nopalea cochenillifera</i> (L.) Salm-Dyck	18010 (VW)	N	K	Hormonal issues			1								
Cactaceae	<i>Nopalea cochenillifera</i> (L.) Salm-Dyck	18010	N	K	gastritis, ulcers, infections & inflammations of liver & kidney, white vaginal flux					1	1	1	1			
Cactaceae	<i>Nopalea cochenillifera</i> (L.) Salm-Dyck	18094 (VW)	N	Q	External tumors, hernias, mumps, dysentheria					1			1			
Cactaceae	<i>Nopalea guatemalensis</i> Roze	18094	N	Q	Fractures	1										
Cactaceae	<i>Rhipsalis baccifera</i> (J.S.Muell.) Stearn	18303	N	Q	Skin problems: 'granos' in the feet, 'sankh'								1			
Camiaceae	<i>Hyptis capitata</i> Jacq.	18348	N	Q	Hemorrhagias			1								
Campanulaceae	<i>Hippobroma longiflora</i> (L.) G.Don	18221	-	Q	Headache, fever									1		1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Campanulaceae	<i>Hippobroma longiflora</i> (L.) G.Don	18086	-	Q	Colic in babies, cramps	1				1						
Campanulaceae	<i>Hippobroma longiflora</i> (L.) G.Don	18403	-	Q	Leishmaniosis - 'mosca chiclera'								1			
Campanulaceae	<i>Lobelia laxiflora</i> Kunth	17969	-	K	Arthritis, rheumatism, body pain, nerves	1	1							1		
Campanulaceae	<i>Lobelia laxiflora</i> Kunth	18028	-	K	Equilibrium of the blood, blood infections, uric acid, cholesterol			1			1					
Cannabaceae	<i>Humulus lupulus</i> L.	18026	-	K	Liver, kidney, nerves, sleeplessness, arthritis, varicose veins, cholesterol, blood toxins		1	1		1	1			1		
Capparaceae	<i>Forchhammeria trifoliata</i> Radlk. ex Millsp.	18311	N	Q	Headache, bad spirits									1	1	
Caprifoliaceae	<i>Valeriana officinalis</i> L.	L	I	K	Nervous system, intestinal infections					1				1		
Caprifoliaceae	<i>Valeriana officinalis</i> L.	L	I	K	Nerves, muscular cramps, epilepsias, uterus, urinary problems, bilis, fever, analgesic, tranquilizing, parasites	1		1		1	1	1		1		1
Caprifoliaceae	<i>Valeriana officinalis</i> L.	L	I	K	Nervous system, tranquilizing									1		
Caprifoliaceae	<i>Valeriana sorbifolia</i> Kunth	17808	N	K	Nerves, depression, stroke, blood circulation		1							1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Commelinaceae		17836, 18323 (VW)	-	Q	Cancer, snakebites								1			1
Compositae	<i>Achillea millefolium</i> L.	18007, 17758 (VW)	I	K	Antibiotic								1			
Compositae	<i>Achillea millefolium</i> L.	18007	I	K	Nervous problems, white vaginal fluxes, purification, desinflammation, purgative, wound healing	1		1		1		1	1	1		
Compositae	<i>Achillea millefolium</i> L.	17758	I	K	Blood purification, coagulation, diuretic, wound healing			1			1		1			
Compositae	<i>Achillea millefolium</i> L.	18007, 17758 (VW)	I	K	Nerves, arthritis	1								1		
Compositae	<i>Acourtia nudicaulis</i> (A.Gray) B.L.Turner	17950	-	K	Nerves, relaxant									1		
Compositae	<i>Ageratum conyzoides</i> (L.) L.	17931 (VW)	N	K	Strenghtens brain									1		
Compositae	<i>Ageratum conyzoides</i> (L.) L.	17931	N	K	Fever, analgesic, stomach ache, colics, cough				1	1				1		1
Compositae	<i>Ageratum conyzoides</i> (L.) L.	18222	N	Q	Asthma				1							
Compositae	<i>Ageratum corymbosum</i> Zuccagni ex Pers.	17814	N	K	Ceremonies, purification, analgesic, reduce blood sugar level, clean wounds			1					1	1	1	
Compositae	<i>Ageratum corymbosum</i> Zuccagni ex Pers.	18159	N	K	Diarrhea, parasites					1						
Compositae	<i>Ageratum corymbosum</i> Zuccagni ex Pers.	SN	N	Q	Clean lungs				1							
Compositae	<i>Ageratum houstonianum</i> Mill.	18066	N	Q	Cough, fever, stomach ache, uterine problems					1		1				
Compositae	<i>Ageratum houstonianum</i> Mill.	18034	N	Q	Cough, fever				1							1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Baccharis salicina</i> Torr. & A.Gray	17885	-	K	Wounds, allergies, 'mal de ojo', spiritual cleansing, lesions	1		1					1		1	
Compositae	<i>Baccharis serraefolia</i> DC.	17934	N	K	Stimulant, tiredness			1								
Compositae	<i>Bidens pilosa</i> L.	18249	-	Q	Back pain	1										
Compositae	<i>Bidens pilosa</i> L.	18018	-	Q	Sleeplessness, bone pain, fever, headache	1								1		1
Compositae	<i>Calea</i> sp.	18061	-	Q	Ulcers, cancer, antibiotic								1			
Compositae	<i>Calyptocarpus wendlandii</i> Sch.Bip.	17915	N	K	Inflammation of liver, purification of the liver					1						
Compositae	<i>Calyptocarpus wendlandii</i> Sch.Bip.	18111	N	K	Analgesic, nerves, sleeplessness, toothache									1		1
Compositae	<i>Chaptalia nutans</i> (L.) Polák	18128	N	Q	Cough, parasites				1	1						
Compositae	<i>Chaptalia nutans</i> (L.) Polák	18128 (VW)	N	Q	Craziness									1		
Compositae	<i>Chaptalia nutans</i> (L.) Polák	18128 (VW)	N	Q												
Compositae	<i>Chaptalia nutans</i> (L.) Polák	SN	N	Q	Inflammations of urinary system						1					
Compositae	<i>Chionolaena salicifolia</i> (Bertol.) G.L.Nesom	18419	N	K	Lung infections, wound healing				1				1			
Compositae	<i>Cichorium intybus</i> L.	17763	I	K	Wounds, ulcers, gastritis liver problems, pancreas, reduce blood sugar level, diuretic, inflammations of kidney, blood purification			1		1	1		1			
Compositae	<i>Cirsium mexicanum</i> DC.	17756 (VW)	N	K	Tonic			1								
Compositae	<i>Cirsium mexicanum</i> DC.	17756	N	K	Purification, digestive, liver, anemia			1		1						
Compositae	<i>Cirsium subcoriaceum</i> (Less.) Sch.Bip. ex Sch.Bip.	17894	N	K	Diuretic, prostate, kidney and urinary infections, nerves, lesions, blood pressure problems						1					

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Cirsium subcoriaceum</i> (Less.) Sch.Bip. ex Sch.Bip.	17789	N	K	Blood purification			1								
Compositae	<i>Cirsium subcoriaceum</i> (Less.) Sch.Bip. ex Sch.Bip.	17894, 17789 (VW)	N	K	Diabetes, arthritis, nervous system, gastritis, infections, ulcers, hernias, stress, blood purification	1		1		1			1	1		
Compositae	<i>Clibadium arboreum</i> Donn.Sm.	18239	N	Q	Cough				1							
Compositae	<i>Clibadium surinamense</i> L.	SN	N	Q	Diabetes			1								
Compositae	<i>Conyza laevigata</i> (Rich.) Pruski	18059	N	Q	Itching, 'granos', tiredness								1	1		
Compositae	<i>Conyza laevigata</i> (Rich.) Pruski	17863	N	Q	Burnings due to a worm under the bed'											1
Compositae	<i>Critonia campechensis</i> (B.L.Rob.) R.M.King & H.Rob.	SN	N	Q	Cleaning lungs				1							
Compositae	<i>Critonia morifolia</i> (Mill.) R.M.King & H.Rob.	17819	N	K	Expectorant, sinusitis				1							
Compositae	<i>Dahlia imperialis</i> Roehl ex Ortgies	18377	-	K	Urinary infection, kidney						1					
Compositae	<i>Dahlia imperialis</i> Roehl ex Ortgies	17937	-	K	Tonic, diuretic, inflammations, purification			1			1		1			
Compositae	<i>Dahlia imperialis</i> Roehl ex Ortgies	18377, 17937 (VW)	-	K	Prevents hair loss, blood circulation, kidneys, pain at urination, intestines, constipation		1			1	1					1
Compositae	<i>Eremosis leiocarpa</i> (DC.) Gleason	17881	N	K	Heart pain, stomach ache, diarrhea, diabetes, parasites		1	1		1						
Compositae	<i>Eremosis leiocarpa</i> (DC.) Gleason	17859	N	Q	Fever, espanto, shock - 'susto'									1		1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Eremosis leiocarpa</i> (DC.) Gleason	17881, 17859 (VW)	N	Q	Fever, cough				1							1
Compositae	<i>Erigeron karvinskianus</i> DC.	17767	N	K	Purification, wound healing, expectorant, tonic			1	1				1			
Compositae	<i>Eupatorium</i> sp.	18460	-	Q	Red or yellow eyes											1
Compositae	<i>Fleischmannia pycnocephala</i> (Less.) R.M.King & H.Rob.	17887	N	K	Influenza, cough, asthma, diabetes, parasites, muscular cramps, epilepsy, uterus, bilis, urinary problems, menstruation, fever, gastritis, ulcers, whole vaginal flux, inflammation, infections	1		1	1	1	1	1	1	1		1
Compositae	<i>Galinsoga quadriradiata</i> Ruiz & Pav.	17913	N	K	Inflammations of nerves									1		
Compositae	<i>Gnaphalium americanum</i> Mill.	17928	-	K	Wounds, inflammations, fever, cough, hemorrhagias, stimulates immune system, expectorant			1	1				1			1
Compositae	<i>Gnaphalium attenuatum</i> DC.	17973	N	K	Gastritis, ulcers, headache, asthma, wounds, lesions, expectorant, white vaginal flux, inflammations, infections				1	1		1	1	1		1
Compositae	<i>Gnaphalium viscosum</i> Kunth	18080	N	K	Wound healing, pulmonary infections				1				1			
Compositae	<i>Heliopsis buphthalmoides</i> (Jacq.) Dunal	18426	N	Q	Bad breath											1
Compositae	<i>Lasianthaea</i> sp.	18087	-	Q	Spiritual cleansing											1
Compositae	<i>Lepidaploa canescens</i> (Kunth) Cass.	18175	N	Q	Cancer								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Lessingianthus mollissimus</i> (D.Don ex Hook. & Arn.) H.Rob.	18093	-	Q	Parasites					1						
Compositae	<i>Leucanthemum vulgare</i> (Vaill.) Lam.	17784	I	K	Wound healing, purification, expectorant			1	1				1			
Compositae	<i>Lycoseris crocata</i> (Bertol.) S.F.Blake	17850	N	Q	Burnings								1			
Compositae	<i>Matricaria chamomilla</i> L.	17832, 18123	I	K	Inflammations of ovaries, stomach, vaginal fluxes, sacred, inflammations, antibiotic, nervous problems, relaxative					1		1	1	1	1	
Compositae	<i>Matricaria chamomilla</i> L.	17832, 18123 (VW)	I	K	Nerves, colic, spasms, nerves, cramps, epilepsy, uterus, bilis, urinary problems, menstrual problems, stomach issues, analgesic, parasites	1				1	1	1		1		
Compositae	<i>Matricaria chamomilla</i> L.	17832, 18123 (VW)	I	K	Nervous system, digestive, blood purification, intestines, blood circulation, impotence, gastritis, gastric ulcers		1	1		1		1	1	1		
Compositae	<i>Matricaria chamomilla</i> L.	17832, 18123 (VW)	I	Q	Asthma				1							
Compositae	<i>Melampodium divaricatum</i> (Rich. ex Rich.) DC.	17992	N	K	Muscular pain, inflammations	1							1			
Compositae	<i>Neurolaena lobata</i> (L.) R.Br. ex Cass.	18033 (VW)	N	Q	Cancer, fever, itching								1			1
Compositae	<i>Neurolaena lobata</i> (L.) R.Br. ex Cass.	18033	N	Q	Gastritis, malaria					1			1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Neurolaena lobata</i> (L.) R.Br. ex 18033 (VW) Cass.		N	Q	Malaria								1			
Compositae	<i>Neurolaena lobata</i> (L.) R.Br. ex 18033 (VW) Cass.		N	Q	Bone pain	1										
Compositae	<i>Pluchea odorata</i> (L.) Cass. 17940 (VW)		N	K	Tonic, arthritis, stimulates maternal milk	1		1				1				
Compositae	<i>Pluchea odorata</i> (L.) Cass. 17940		N	K	Urinary problems in females, tonic, purification, analgesic, inflammations			1			1	1	1	1		
Compositae	<i>Porophyllum punctatum</i> (Mill.) S.F.Blake 18238		N	Q	Craziness									1		
Compositae	<i>Roldana petasitis</i> (Sims) H.Rob. & Brettell 17875		-	K	Colds, fever, expectorant				1							1
Compositae	<i>Schistocarpha eupatorioides</i> (Fenzl) Kuntze 18425		N	Q	Bone ache, headache, asthma	1			1					1		
Compositae	<i>Senecio salignus</i> DC. 18118, 18041		N	K	Sacred, diuretic, inflammations, relaxative			1			1		1		1	
Compositae	<i>Senecio salignus</i> DC. 17791		N	K	Blood purification, analgesic, ceremonial, strengthen the blood, expectorant			1	1					1	1	
Compositae	<i>Senecio salignus</i> DC. 18163		N	K	Sacred, swellings, inflammations, circulatory problems, uric acid, colic, bilis, stomach problems, saturations, cleansing of negative energies	1	1	1		1	1		1		1	1
Compositae	<i>Silybum marianum</i> (L.) Gaertn. 17792		I	K	Blood purification, cleans the liver, hepatitis, stones in kidney and liver			1		1	1					

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Silybum marianum</i> (L.) Gaertn.	17792 (VW)	I	K	Diabetes, nervous system, arthritis, gastritis, infections, ulcers, hernias, stress, blood purification	1		1		1			1	1		
Compositae	<i>Sonchus oleraceus</i> (L.) L.	18298	I	K	Inflammation of the nervous system									1		
Compositae	<i>Sonchus oleraceus</i> (L.) L.	18298, 17927 (VW)	I	K	Purgative					1						
Compositae	<i>Sonchus oleraceus</i> (L.) L.	17927	I	K	Blood purification, wound healing, stimulate maternal milk			1				1	1			
Compositae	<i>Sphagneticola trilobata</i> (L.) Pruski	18235	-	Q	Anemia			1								
Compositae	<i>Sphagneticola trilobata</i> (L.) Pruski	18358	-	Q	Craziness									1		
Compositae	<i>Stevia polycephala</i> Bertol	17798	N	K	Stomach ache, inflammations, ceremonial, analgesic, blood purification, blood sugar level, wound healing			1		1			1	1	1	
Compositae	<i>Stevia suaveolens</i> Lag.	17810	N	K	Ceremonial, saturations											1
Compositae	<i>Stevia suaveolens</i> Lag.	17810 (VW)	N	K	Nervous system, parkinson, hernias, ulcers, cysts, tumors, cancer, stimulates immune system			1		1		1	1	1		
Compositae	<i>Tagetes erecta</i> L.	18186	N	K	Parasites, antibiotic, sacred					1			1		1	
Compositae	<i>Tagetes erecta</i> L.	18186 (VW)	N	K	Leukemia, weakness of the blood, colic, tetanus			1		1			1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Tagetes erecta</i> L.	18186 (VW)	N	K	Analgesic, stimulating immune system, wound healing, blood purification, antibiotic, saturations			1					1	1	1	
Compositae	<i>Tagetes erecta</i> L.	18186 (VW)	N	K	Tonic, hemorrhagias			1								
Compositae	<i>Tagetes erecta</i> L.	18231	N	Q	Asthma, pneumonia, tuberculosis				1							
Compositae	<i>Tagetes erecta</i> L.	18400	N	Q	Headache, fever									1		1
Compositae	<i>Tagetes erecta</i> L.	18400, 18231 (VW)	N	Q	Stomach cramps					1						
Compositae	<i>Tagetes lucida</i> Cav.	17773 (VW)	N	K	Sacred										1	
Compositae	<i>Tagetes lucida</i> Cav.	17773 (VW)	N	K	Arthritis, lesions, diarrhea, vomiting, nervous issues, muscular cramps, epilepsy, uterus, bilis, urinary issues, blood purification, menstruation	1		1		1	1	1		1		
Compositae	<i>Tagetes lucida</i> Cav.	17773	N	K	Ceremonial, blood purification, analgesic, diarrhea, colc, digestive, temperature of the stomach			1		1				1	1	1
Compositae	<i>Tagetes lucida</i> Cav.	17773 (VW)	N	Q	Asthma				1							
Compositae	<i>Tanacetum parthenium</i> (L.) Sch.Bip.	17820, 18301	I	K	Parasites, 'acidity of the stomach', sacred					1					1	
Compositae	<i>Tanacetum parthenium</i> (L.) Sch.Bip.	17820, 18301, 17742 (VW)	I	K	lesions due to hits, facilitate delivery, arthritis, cough, rheumatism, muscular cramps, epilepsy, uterus, bilis, urinary issues, menstruation	1	1		1	1	1	1		1		
Compositae	<i>Tanacetum parthenium</i> (L.) Sch.Bip.	17742	I	K	Blood purification, analgesic			1						1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Tanacetum parthenium</i> (L.) Sch.Bip.	17820, 18301, 17742 (VW)	I	K	Sacred, inflammations, 'granos', menstruation							1	1		1	
Compositae	<i>Taraxacum campylodes</i> G.E.Haglund	18101	I	K	Nervous problems, inflammations, diuretic						1		1	1		
Compositae	<i>Taraxacum campylodes</i> G.E.Haglund	18020	I	K	Diabetes, gastritis, ulcers			1		1			1			
Compositae	<i>Telanthophora arborescens</i> (Steetz) H.Rob. & Brettell	17923	N	K	relaxant, inflammations, diuretic						1		1	1		
Compositae	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	18140	-	K	Digestion, intestines, rheumatism, blood purification, swellings	1	1	1		1						
Compositae	<i>Tithonia longiradiata</i> (Bertol.) S.F.Blake	17932 (VW)	-	K	Lesions due to hits, arthritis, rheumatism, diarrhea, wounds, fractures	1	1			1			1			
Compositae	<i>Tithonia longiradiata</i> (Bertol.) S.F.Blake	17932	-	K	Fractures & inflammatio due to hits	1										
Compositae	<i>Tithonia longiradiata</i> (Bertol.) S.F.Blake	17932 (VW)	-	K	Arthritis, varicose veins, cartilages, skin frills	1	1						1			
Compositae	<i>Verbesina fraseri</i> Hemsl.	17966	-	K	Lesion due to hits, arthritis, stomach, chills	1				1						1
Compositae	<i>Vernonanthura patens</i> (Kunth) H.Rob.	18334	-	Q	Fever											1
Compositae	<i>Vernonia sp.</i>	18458	-	Q	Tiredness									1		
Compositae	<i>Viguiera cordata</i> (Hook. & Arn.) d'Arcy	17821, 17912	-	K	inflammations of bones and muscles due to hits, increases liquid in the bones, arthritis, rheumatism, cartilages	1	1									
Compositae	<i>Viguiera dentata</i> (Cav.) Spreng.	18428	-	K	Cysts in the prostate, infections, urinary infections, kidneys, sacred						1	1			1	

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Compositae	<i>Zinnia peruviana</i> (L.) L.	17914	N	K	Depressions									1		
Compositae		17943	-	K	Fever											1
Compositae		17929	-	K	Stomach ache					1						
Compositae		18142	-	K	Pulmonary infections, cough, cysts, ulcers, tumors, wound healing				1				1			
Compositae		SN	-	K	Uric acid, boes, osteoporosis, sacred, alcoholism, cartilages, back ache, epilepsy, nervous problems, internal cleansing	1					1		1	1	1	1
Compositae		17914	-	K	Inflammations, menstrual problems, parasites, 'bultos' in the stomach, digestion, intestines, thick blood, varicose veins, uric acid, colesterol		1	1		1	1	1	1			
Compositae		18366 (VW)	-	Q	Attacks									1		
Compositae		18437	-	Q	Fever, epilepsy, diarrhea, vomiting					1				1		1
Compositae		18362	-	Q	Fever, attacks, skin problems: 'granos'								1	1		1
Compositae		18286	-	Q	Skin problems: 'granos'								1			
Compositae		SN	-	Q	Fever											1
Compositae		18351	-	Q	Headache									1		
Compositae		18366	-	Q	Craziness									1		
Convolvulaceae	<i>Cuscuta corymbosa</i> var. <i>grandiflora</i> Engelm.	18146	-	K	Kidney and bladder stones, supernatural problems,, cancer, ulcers, cysts, tumors, sacred, cleansing of sins						1		1		1	
Convolvulaceae	<i>Evolvulus nummularius</i> (L.) L.	18332	N	Q	Ulcers, swellings								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Convolvulaceae	<i>Ipomoea batatas</i> (L.) Lam.	17853	N	Q	Stomach ulcers, stomach ache, analgesic, urinary problems, internal infections					1	1		1	1		
Convolvulaceae	<i>Ipomoea indica</i> (Burm.) Merr.	18237	N	Q	Post-delivery care							1				
Convolvulaceae	<i>Ipomoea purga</i> (Wender.) Hayne	L	-	K	Parasites					1						
Convolvulaceae	<i>Ipomoea purga</i> (Wender.) Hayne	L	-	K	Purgative					1						
Convolvulaceae	<i>Ipomoea purga</i> (Wender.) Hayne	L	-	Q	Fever											1
Convolvulaceae	<i>Ipomoea purpurea</i> (L.) Roth	17813	N	K	Purgative, blood purification, snake bites, arthritis	1		1		1						1
Convolvulaceae	<i>Ipomoea silvicola</i> House	18369	-	Q	Ears plugged											1
Convolvulaceae	<i>Ipomoea sp.</i>	17812	-	K	Purgative, blood purification, snake bites, arthritis	1		1		1						1
Convolvulaceae	<i>Ipomoea sp.</i>	17980	-	Q	Fever, gastritis					1						1
Convolvulaceae	<i>Operculina pinnatifida</i> (Kunth) O'Donell	18436	N	Q	Cramps	1										
Costaceae	<i>Costus pulverulentus</i> C.Presl	18234, 18223	N	Q	Infections, or sudden child death, prostate, very slim persons			1				1	1	1		
Costaceae	<i>Costus pulverulentus</i> C.Presl	18326	N	Q	Urinary problems						1					
Costaceae	<i>Costus pulverulentus</i> C.Presl	18401	N	Q	Prostate, infertile women							1				
Costaceae	<i>Costus pulverulentus</i> C.Presl	18200	N	Q	Prostate							1				
Costaceae	<i>Costus sp.</i>	17985	-	K	Pneumonia, shivering, diabetes, uric acid, inflammations, infections, gastritis, ulcers			1	1	1	1		1			
Costaceae	<i>Costus sp.</i>	18048	-	Q	Infertile women							1				
Costaceae	<i>Costus sp.</i>	18199	-	Q	Cleanses prostate							1				

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Crassulaceae	<i>Kalanchoe blossfeldiana</i> Poelln.	18466	-	Q	Cramps, blindness	1										1
Cucurbitaceae	<i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai	L	I	K	Fever											1
Cucurbitaceae	<i>Cucumis sativus</i> L.	L	I	K	Inflammations								1			
Cucurbitaceae	<i>Cucurbita argyrosperma</i> C.Huber	L	-	Q	Hepatitis					1						
Cucurbitaceae	<i>Cyclanthera dissecta</i> (Torr. & A.Gray) Arn.	17842	N	Q	Mosquito bites, skin problems: 'granos, ronchas'								1			
Cucurbitaceae	<i>Gurania makoyana</i> (Lem.) Cogn.	17884	N	Q	Ulcers, 'sankh'								1			
Cucurbitaceae	<i>Momordica charantia</i> L.	18247	I	Q	Dengue, malaria								1			
Cucurbitaceae	<i>Momordica charantia</i> L.	17857, 18254, 18247, 18318 (VW)	I	Q	Diabetes			1								
Cucurbitaceae	<i>Momordica charantia</i> L.	18318	I	Q	Gastritis					1						
Cucurbitaceae	<i>Momordica charantia</i> L.	17857, 18254	I	Q	Gastritis, rheumatism		1			1						
Cucurbitaceae	<i>Sechium edule</i> (Jacq.) Sw.	18184	N	K	Parasites, gastric problems, wound healing					1			1			
Cucurbitaceae	<i>Sicydium tuerckheimii</i> Donn.Sm.	SN	N	Q	Heart problems, infarct		1									
Cucurbitaceae		18372	-	Q	Colic					1						
Cupressaceae	<i>Cupressus lusitanica</i> Mill.	17876	N	K	Influenza, cough, facilitates deliveries, asthma, menstrual problems				1			1				

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Cupressaceae	<i>Cupressus lusitanica</i> Mill.	17876 (VW)	N	K	Analgesic, expectorant, inflammations				1				1	1		
Cupressaceae	<i>Cupressus lusitanica</i> Mill.	17876 (VW)	N	K	Ceremonial cleansing, sacred, nervous system, small arteries, varicose veins, arthritis, limbs that loose feeling	1	1							1	1	
Cupressaceae	<i>Cupressus lusitanica</i> Mill.	17876 (VW)	N	Q	Toothache											1
Cyperaceae	<i>Cyperus compressus</i> L.	18127	N	Q	Lungs that clash with the liver											1
Cyperaceae	<i>Cyperus sp.</i>	18149	-	K	Nervous system, blood purification, fatty liver, destroys kidney & bladder stones			1		1	1			1		
Cyperaceae	<i>Kyllinga brevifolia</i> Rottb.	18217	N	Q	Stimulates appetite			1								
Davalliaceae	<i>Nephrolepis cordifolia</i> (L.) C. Presl	18352 (VW)	N	Q	Snake bites											1
Davalliaceae	<i>Nephrolepis cordifolia</i> (L.) C. Presl	18352	N	Q	Bad spirits, craziness									1	1	
Dryopteridaceae	<i>Arachniodes denticulata</i> (Sw.) Ching	17743	N	K	Diuretic, blood coagulation, wound healing, cleanse kidneys, clean skin			1			1		1			
Dryopteridaceae	<i>Ctenitis salvinii</i> (Baker) Stolze	18255	N	Q	Fever											1
Dryopteridaceae	<i>Elaphoglossum sp.</i>	18021	-	K	Pancreas, inflammations, destroy kidney stones, increase appetite, prostate, liver, gallbladder			1		1	1	1	1			
Equisetaceae	<i>Equisetum hyemale</i> L.	18295	-	K	Inflammations, analgesic, uterus, bladder, antibiotic						1	1	1	1		
Equisetaceae	<i>Equisetum hyemale</i> L.	18295 (VW)	-	K	Inflammations, gastritis, ulcers, infections, swellings due to heat, white vaginal flux					1		1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Equisetaceae	<i>Equisetum hyemale</i> L.	18295 (VW)	-	Q	Leishmaniosis - 'mosca chiclera', ulcers, 'sankh'								1			
Equisetaceae	<i>Equisetum hyemale</i> var. <i>affine</i> (Engelm.) A.A. Eaton	17744	-	K	Diuretic, kidneys, wound healing						1		1			
Equisetaceae	<i>Equisetum hyemale</i> var. <i>affine</i> (Engelm.) A.A. Eaton	18150	-	K	Diuretic, infections, cysts, prostate, ovaries, kidney stones, urinary problems, allergies, blood issues, purification			1			1	1	1			
Euphorbiaceae	<i>Acalypha aristata</i> Kunth	17971	N	K	Gastritis, ulcers, swellings, white vaginal flux, inflammation, infections, diuretic, prostate, infections of kidney and bladder, cancer					1	1	1	1			1
Euphorbiaceae	<i>Acalypha aristata</i> Kunth	17746	N	K	Diuretic, blood purification, wound healing			1			1		1			
Euphorbiaceae	<i>Acalypha aristata</i> Kunth	18473	N	Q	Uterine cancer							1	1			
Euphorbiaceae	<i>Acalypha aristata</i> Kunth	18327	N	Q	Uterine pain							1				
Euphorbiaceae	<i>Acalypha guatemalensis</i> Pax & K.Hoffm.	17920	N	K	Allergies caused by insects, uric acid			1			1					
Euphorbiaceae	<i>Acalypha guatemalensis</i> Pax & K.Hoffm.	18002	N	K	Granos', cancer, cysts, inflammations, infections					1		1	1			
Euphorbiaceae	<i>Acalypha mortoniana</i> Lundell	18412	-	Q	Swellings with purulence								1			
Euphorbiaceae	<i>Croton guatemalensis</i> Lotsy	17946	-	K	Diabetes, bronchial problems, toothache, cough			1	1							1
Euphorbiaceae	<i>Euphorbia cotinifolia</i> L.	17964	-	K	Skin problems: 'arrugas'								1			
Euphorbiaceae	<i>Euphorbia cotinifolia</i> L.	18126	-	Q	Problems of the blood pressure, vomiting blood		1									1
Euphorbiaceae	<i>Euphorbia heterophylla</i> L.	18335	-	Q	Wounds								1			
Euphorbiaceae	<i>Euphorbia heterophylla</i> L.	18346	-	Q	Wounds								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Euphorbiaceae	<i>Euphorbia milii</i> Des Moul.	18463	-	Q	Lungs, asthma				1							
Euphorbiaceae	<i>Euphorbia sp.</i>	17855	-	Q	Gonorrhoea								1			
Euphorbiaceae	<i>Jatropha curcas</i> L.	18116	-	K	Wound healing, inflammations								1			
Euphorbiaceae	<i>Ricinus communis</i> L.	17916	I	K	Purgative					1						
Euphorbiaceae	<i>Ricinus communis</i> L.	17916, 18307 (VW)	I	K	Purgative					1						
Euphorbiaceae	<i>Ricinus communis</i> L.	18307	I	K	Purgative, 'kix sawi', arthritis, ulcers	1				1						1
Euphorbiaceae	<i>Ricinus communis</i> L.	17916, 18307 (VW)	I	K	Parasites, antibiotic, purgative, blood purification, general purification			1		1			1			
Euphorbiaceae	<i>Stillingia acutifolia</i> (Benth.) Benth. & Hook.f. ex Hemsl.	17945	-	K	Skin issues: 'cayos, berrugas, granos', tumors, rubefacient								1			
Fagaceae	<i>Quercus conspersa</i> Benth.	18160	N	K	Toothache, nervous system, arthritis, arteriosclerosis, digestive problems	1	1			1				1		1
Fagaceae	<i>Quercus crassifolia</i> Bonpl.	17769	-	K	Purification, wound healing, tonic, allergies			1					1			
Fagaceae	<i>Quercus skinneri</i> Benth.	17878	N	K	Stomach ache, tonic, pain in the vains & arteries, circulatory problems, chills		1	1		1						1
Gentianaceae	<i>Eustoma exaltatum</i> (L.) Salisb.	17993	N	Q	Ulcers, diarrhea, vomiting					1			1			
Gentianaceae	<i>Eustoma exaltatum</i> (L.) Salisb.	18252	N	Q	children problems: 'numay, igillo', energetical problem: 'mal de ojo'										1	1
Geraniaceae	<i>Geranium repens</i> H.E.Moore	17800	-	K	Clean wounds, purification, diuretic, allergies, digestive			1		1	1		1			
Geraniaceae	<i>Pelargonium × hortorum</i> L.H. Bailey	18042, 17831, 18300	I	K	Sacred, normalizes energy of the blood, analgesic			1						1	1	

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Geraniaceae	<i>Pelargonium graveolens</i> L'Hér.	18006	I	K	Influenza, cough wound healing				1				1			
Gesneriaceae	<i>Achimenes erecta</i> (Lam.) H.P.Fuchs	18339	-	Q	'Hijito'											1
Gesneriaceae	<i>Besleria laxiflora</i> Benth.	18264, 18441	-	Q	Snake bites											1
Gesneriaceae	<i>Codonanthe crassifolia</i> (H.Focke) C.V.Morton	18347	-	Q	Granos' in the throat, black magic					1			1		1	
Gesneriaceae	<i>Columnea sulfurea</i> Donn Sm.	18058	-	Q	Vomiting with blood, eye pain, cough				1							1
Gesneriaceae	<i>Columnea sulfurea</i> Donn Sm.	SN	-	Q	Gastritis, stomach ache, headache					1				1		
Gesneriaceae	<i>Moussonia deppeana</i> (Schltdl. & Cham.) Klotzsch ex Hanst.	18241	-	Q	Shocks 'susto' due to sex, tumors								1	1		
Ginkgoaceae	<i>Ginkgo biloba</i> L.	L	-	K	Nervous system, arthritis, cartilages, varicose veins, sleeplessness, strokes	1	1							1		
Heliconiaceae	<i>Heliconia psittacorum</i> L.f.	17867 (VW)	-	Q	Cramps	1										
Heliconiaceae	<i>Heliconia psittacorum</i> L.f.	17867	-	Q	Cramps in stomach and body	1				1						
Heliconiaceae	<i>Heliconia subulata</i> Ruiz & Pav.	18292	-	Q	Cramps in stomach and body	1				1						
Hypericaceae	<i>Hypericum epigeium</i> Keller	17776	N	K	Depressions, nervous problems									1		
Hypericaceae	<i>Hypericum perforatum</i> L.	17948	-	K	Depressions									1		
Hypericaceae	<i>Vismia camparaguey</i> Sprague & L.Riley	18057	N	Q	Hepatitis					1						
Hypoxidaceae	<i>Hypoxis decumbens</i> L.	18050	N	Q	Tuberculosis, cough				1							

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Lamiaceae	<i>Origanum vulgare</i> L.	L	I	K	Diarrhea, vomiting, arthritis, rheumatism, cough, nervous excitation, cramps, epilepsy, uterus, bilis, urinary problems	1	1		1	1	1	1		1		
Lamiaceae	<i>Rosmarinus officinalis</i> L.	17816	I	K	Sacred, joints, energy of the blood	1		1							1	
Lamiaceae	<i>Rosmarinus officinalis</i> L.	17905	I	K	Lesions due to hits, arthritis, gallbladder problems, rheumatism, cramps, epilepsy, uterus, bilis, tonic, expectorant	1	1	1	1	1	1	1		1		
Lamiaceae	<i>Rosmarinus officinalis</i> L.	17782	I	K	Purification, ceremonial, analgesic, expectorant, purification, saturations		1	1						1	1	
Lamiaceae	<i>Rosmarinus officinalis</i> L.	17816, 17905, 17782 (VW)	I	K	Stimulating hair growth, kidneys, circulation, sacred, cleansing of negative energies		1				1				1	
Lamiaceae	<i>Rosmarinus officinalis</i> L.	17816, 17905, 17782 (VW)	I	Q	Black magic										1	
Lamiaceae	<i>Salvia cinnabarina</i> M.Martens & Galeotti	18398	N	K	Uric acid						1					
Lamiaceae	<i>Salvia coccinea</i> Buc'hoz ex Etl.	L	N	K	Antibiotic, diuretic, balance blood sugar level			1			1		1			
Lamiaceae	<i>Salvia coccinea</i> Buc'hoz ex Etl.	L	N	K	Tonic, wound healing, stimulates immune system			1					1			
Lamiaceae	<i>Salvia sp.</i>	17938 (VW)	-	K	Respiratory problems, infections				1				1			
Lamiaceae	<i>Salvia sp.</i>	17938 (VW)	-	K	Menstruation							1				
Lamiaceae	<i>Salvia sp.</i>	17938	-	K	Colic, analgesic, stomach issues					1				1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Lamiaceae	<i>Salvia urica</i> Epling	18429	N	K	Prostate, ovaries, menstruation control, ovarian cysts and tumors, stomach ache, menstrual colic, sacred							1	1			
Lamiaceae	<i>Thymus vulgaris</i> L.	L	I	K	Abortive							1				
Lamiaceae	<i>Thymus vulgaris</i> L.	L	I	K	Nerves, muscular cramps, epilepsy, uterus, bilis, urinary issues, expectorant, fever	1		1	1	1	1	1		1		1
Lauraceae	<i>Cinnamomum</i> sp.	L	-	K	Sacred, antibiotic								1		1	
Lauraceae	<i>Cinnamomum</i> sp.	L	-	K	Cough, parasites				1	1						
Lauraceae	<i>Cinnamomum</i> sp.	L	-	K												
Lauraceae	<i>Cinnamomum</i> sp.	L	-	K	Nerves, arthritis, strokes, ceremonial	1								1	1	1
Lauraceae	<i>Cinnamomum</i> sp.	L	-	Q	Black magic										1	
Lauraceae	<i>Cinnamomum verum</i> (L.) Farw.	18275	-	Q	Prevent pregnancies							1				
Lauraceae	<i>Cinnamomum zeylanicum</i> Breyne	SN	-	Q	Uterus problems							1				
Lauraceae	<i>Litsea glaucescens</i> Kunth.	18383	N	K	Relaxative, high blood pressure		1							1		
Lauraceae	<i>Litsea glaucescens</i> Kunth.	18164	N	K	Sacred, digestive, swollen stomach					1					1	
Lauraceae	<i>Nectandra lineata</i> (Kunth) Rohwer	18244	N	Q	Cleans the stomach, constipation, inflammations of the stomach					1						
Lauraceae	<i>Persea americana</i> Mill.	17986 (VW)	N	K	Balance blood sugar level			1								
Lauraceae	<i>Persea americana</i> Mill.	17986	N	K	Nervous problems, preventing pregnancies, toothache, colic							1		1		1
Lauraceae	<i>Persea americana</i> Mill.	17986 (VW)	N	K	Kix Sawi', reduce blood sugar level, diuretic, blood purification, stimulating the immune system			1			1					1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Lauraceae	<i>Persea americana</i> Mill.	17986 (VW)	N	K	Allergies, lesions due to hits, fractures, 'clean the joints'	1		1								
Lauraceae	<i>Persea americana</i> Mill.	17986 (VW)	N	Q	Hernias, mumps					1			1			
Lauraceae	<i>Persea americana</i> Mill.	17986 (VW)	N	Q	Abortive								1			
Leguminosae	<i>Acacia angustissima</i> (Mill.) Kuntze	18422	-	K	Strenghtens bones, parasites, diarrhea, infections of prostate and ovaries, menstruation	1				1		1				
Leguminosae	<i>Acacia cookii</i> Saff.	18085	-	Q	Papules due to bad food, itching								1			
Leguminosae	<i>Bauhinia divaricata</i> L.	17854	-	Q	Miscular pain, back pain	1								1		
Leguminosae	<i>Bauhinia glabra</i> Jacq.	17869	-	Q	Diabetes			1								
Leguminosae	<i>Caesalpinia yucatanensis</i> Greenm.	18353	-	Q	Attacks, people that cannot speak well, craziness due to bad spirits									1	1	
Leguminosae	<i>Calliandra houstoniana</i> (Mill.) Standl.	17998	-	K	Vomiting, defecation problems in children, stomach infections, parasites					1						
Leguminosae	<i>Cassia sp.</i>	18148	-	K	Blood purification, stimulating appetite, pancreas, depressions, central nervous system, headache, low blood pressure, kidneys, fatty liver, uric acid, varicose veins, skin allergies, pustules in the face that itch		1	1		1	1		1	1		
Leguminosae	<i>Centrosema pubescens</i> Benth.	18378	-	K	Amoebas, diabetes			1		1						
Leguminosae	<i>Cojoba arborea</i> (L.) Britton & Rose	18039	-	Q	Snake bites, saturations										1	1
Leguminosae	<i>Crotalaria longirostrata</i> Hook. & Arn.	18067	-	K	Purgative, parasites					1						

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Leguminosae	<i>Crotalaria sp.</i>	18067, 17976 (VW)	- K	Sleeplessness, nervous system, arthritis	1								1		
Leguminosae	<i>Crotalaria vitellina</i> Ker. Gawl.	17976	- K	Tranquilizing, sleeplessness									1		
Leguminosae	<i>Desmodium incanum</i> DC.	17990, 18452	- Q	Expulse placenta, deliveries that go too fast, shock 'susto' during sex							1		1		
Leguminosae	<i>Desmosium sp.</i>	18029	- Q	Bone pain	1										
Leguminosae	<i>Diphysa americana</i> (Mill.) M.Sousa	17960	- K	Tonic, lesions due to hits, body pain, diabetes	1		1						1		
Leguminosae	<i>Diphysa floribunda</i> Peyr.	18385	- K	Uric acid, circulation		1				1					
Leguminosae	<i>Diphysa floribunda</i> Peyr.	18418	- K	Sleeplessness, nervous system, stress, sacred, osteoporosis, bones, ceremonial	1								1	1	
Leguminosae	<i>Erythrina berteroana</i> Urb.	18100	- K	Sacred, uterus, antibiotic, purgative					1		1	1		1	
Leguminosae	<i>Erythrina berteroana</i> Urb.	SN	- K	Influenza, snake bites				1							1
Leguminosae	<i>Erythrina berteroana</i> Urb.	18100, 18330 (VW)	- K	Antibiotic, blood issues, sacred, alcoholism, tonic, osteoporosis, cartilages, back pain, supernatural problems, epilepsy, nervous convulsions, purification	1		1					1	1		1
Leguminosae	<i>Erythrina berteroana</i> Urb.	18100, 18330 (VW)	- Q	Muscular pain									1		
Leguminosae	<i>Erythrina berteroana</i> Urb.	18330	- Q	Sleeplessness									1		
Leguminosae	<i>Erythrina berteroana</i> Urb.	18100, 18330 (VW)	- Q	Uterine pain, intestinal pain, bone pain, headache, blood problems, skin problems	1		1				1	1	1		
Leguminosae	<i>Eysenhardtia adenostylis</i> Baill.	18380	- K	Kidney infections						1					

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Leguminosae	<i>Eysenhardtia adenostylis</i> Baill.	18380, 17754 (VW)	-	K	Inflammations of liver, gastritis, ulcers, inflammations, infections, swellings due to heat, white vaginal flux					1		1	1			
Leguminosae	<i>Eysenhardtia adenostylis</i> Baill.	17754	-	K	Diuretic, leukemia, reduce blood sugar level			1			1		1			
Leguminosae	<i>Gliricidia sepium</i> (Jacq.) Walp.	18032 (VW)	N	Q	Children problem: 'numay'											1
Leguminosae	<i>Gliricidia sepium</i> (Jacq.) Walp.	18032	N	Q	Children problem: 'numay'											1
Leguminosae	<i>Lupinus mexicanus</i> Lag.	17797	-	K	Anemia, leukemia			1					1			
Leguminosae	<i>Lupinus mexicanus</i> Lag.	17797 (VW)	-	K	Stimulating maternal milk							1				
Leguminosae	<i>Melilotus indicus</i> (L.) All.	17917	-	K	Hernias					1						
Leguminosae	<i>Mimosa albida</i> var. <i>willdenowii</i> (Poir.) Rudd	17970	-	K	Nervous system, sacred, liver, kidney, bladder, epilepsy, stress, sleeplessness					1	1			1	1	
Leguminosae	<i>Mimosa albida</i> Willd.	17997	-	K	Purification, fungi, arthritis, rheumatism, facilitate delivery		1	1		1		1	1			
Leguminosae	<i>Mimosa pudica</i> L.	18450	-	Q	Shocks: 'espanto, susto'									1		
Leguminosae	<i>Mimosa pudica</i> L.	18450, 18288, 18373 (VW)	-	Q	Craziness									1		
Leguminosae	<i>Mimosa pudica</i> L.	18288	-	Q	Toothache											1
Leguminosae	<i>Mimosa pudica</i> L.	18373	-	Q	Nerves, shock 'susto' due to sex							1		1		
Leguminosae	<i>Pithecellobium pachypus</i> Pittier	18177	-	Q	Hepatitis, 'susto'					1				1		
Leguminosae	<i>Senna alata</i> (L.) Roxb.	18233	N	Q	Anemia, parasites			1		1						
Leguminosae	<i>Senna occidentalis</i> L. (Link)	18246	-	Q	Anemia, uterus, skin problems: 'granos'	1						1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Leguminosae	<i>Tamarindus indica</i> L.	L	I	K	Diabetes, gastritis, ulcers, inflammations, infections, fever			1		1			1			1
Leguminosae	<i>Trigonella foenum-graecum</i> L.	L	I	K	Inflammations, kills bad cells								1			
Leguminosae	<i>Trigonella foenum-graecum</i> L.	L	I	K	Blood purification, inflammations, wound healing, rubefacient			1		1			1			
Leguminosae	<i>Trigonella foenum-graecum</i> L.	L	I	K	Cysts, tumors, cancer, ulcers, hernias, infections, wounds healing, allergies, skin: 'granos'			1		1			1			
Leguminosae	<i>Vicia villosa</i> Roth	17930	-	K	Tonic, blood purification, diuretic, inflammations			1			1		1			
Lentibulariaceae	<i>Pinguicula moranensis</i> Kunth	18154	-	K	Gastritis, ulcers, wound healing, stress, headache, nervous system, blood purification, 'acid throat'			1		1			1	1		
Linaceae	<i>Linum usitatissimum</i> L.	L	I	K	Analgesic, destroy tissue - 'masas'								1	1		
Linaceae	<i>Linum usitatissimum</i> L.	L	I	K	Constipation, gastritis, ulcers, infections, inflammations, 'granos', lesions	1				1			1			
Linaceae	<i>Linum usitatissimum</i> L.	L	I	K	Inflammations, wound healing, diuretic, regenerating tissue, cleaning stomach - rubefacient					1	1		1			
Loranthaceae	<i>Struthanthus sp.</i>	18104	-	K	Antibiotic, wound healing, destroys tissue: 'masas'								1			
Loranthaceae	<i>Struthanthus sp.</i>	17891	-	K	Nervous problems, gastritis, ulcers, inflammation, infections					1			1	1		

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Loranthaceae	<i>Struthanthus sp.</i>	18189	- K	Cancer, ulcers, mastitis, cysts, tumors, nervous system, stimulates immune system, kills bad cells, sleeplessness, infections, arthritis, blood purification, uric acid	1		1			1	1	1	1		
Loranthaceae	<i>Struthanthus sp.</i>	17845	- Q	Poisons, skin issues: 'granos'								1			1
Loranthaceae	<i>Struthanthus tacanensis</i> Lundell	17745	- K	Blood purification, inflammations, cardiotonic, wound healing, rubefacient		1	1		1			1			
Lygodiaceae	<i>Lygodium heterodoxum</i> Kunze	17840 (VW)	N Q	Epilepsy									1		
Lygodiaceae	<i>Lygodium heterodoxum</i> Kunze	17840	N Q	Rheumatism, joint pain	1	1									
Lythraceae	<i>Cuphea carthagenensis</i> (Jacq.) J.F.Macbr.	18457	N Q	Nerves									1		
Lythraceae	<i>Cuphea hyssopifolia</i> Kunth	18081 (VW)	N Q	Hepatitis, anemia, ceremonial, shock 'susto'			1		1				1	1	
Lythraceae	<i>Cuphea hyssopifolia</i> Kunth	18081	N Q	Cough, child illness 'numay'				1							1
Lythraceae	<i>Cuphea hyssopifolia</i> Kunth	18081 (VW)	N Q	Children that cry a lot											1
Lythraceae	<i>Punica granatum</i> L.	L	I K	Sacred, stomach problems, diarrhea, tranquilizing, headache, stress					1				1	1	
Magnoliaceae	<i>Magnolia grandiflora</i> L.	17879	- K	Fever, high blood pressure, nervous problems, parkinson		1							1		1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Malpighiaceae	<i>Byrsonima crassifolia</i> (L.) Kunth	18299	N	K	Tonsils, allergies			1								
Malpighiaceae	<i>Byrsonima crassifolia</i> (L.) Kunth	18207	N	Q	Diabetes			1								
Malvaceae	<i>Abelmoschus esculentus</i> (L.) Moench	18134	-	Q	Tumors: dries, cleans and reduces pain								1			
Malvaceae	<i>Chiranthodendron pentadactylon</i> Larreat.	17977	N	K	Nerves, hemorrhoides								1	1		
Malvaceae	<i>Gossypium hirsutum</i> L.	18448	-	Q	Asthma				1							
Malvaceae	<i>Guazuma ulmifolia</i> Lam.	L	N	Q	Intestinal ulcers, stomach ulcers					1			1			
Malvaceae	<i>Heliocarpus popayensis</i> Kunth	18082	-	Q	Trigger deliveries, urinary problems						1	1				
Malvaceae	<i>Heliocarpus popayensis</i> Kunth	18082 (VW)	-	Q	Pain during delivery, refreshing							1				1
Malvaceae	<i>Hibiscus rosa-sinensis</i> L.	SN	-	Q	Alleviates pain during delivery, facilitates delivery							1				
Malvaceae	<i>Hibiscus rosa-sinensis</i> L.	18203	-	Q	Colic, gastritis					1				1		
Malvaceae	<i>Hibiscus sabdariffa</i> L.	L	I	K	Diabetes, gastritis, ulcers, inflammations, infections, water retention in the tissue, kidney and bladder infections			1		1	1		1			
Malvaceae	<i>Hibiscus sabdariffa</i> L.	L	I	K	Strokes, nervous system, arthritis, uric acid, cholesterol, blood toxins	1		1			1			1		
Malvaceae	<i>Kearnemalvastrum subtriflorum</i> (Lag.) D.M.Bates	18141	-	K	Wound healing, infections, cysts, tumors, ulcers, allergies, cancer, nerves, blood purification, circulation		1	1					1	1		
Malvaceae	<i>Malachra alceifolia</i> Jacq.	18430	-	Q	Cancer								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Malvaceae	<i>Malva parviflora</i> L.	18102	I	K	Analgesic, inflammations, destroy tissue - 'masas'								1	1		
Malvaceae	<i>Malva parviflora</i> L.	18005	I	K	gastritis, ulcers, inflammations, infections, white vaginal flux, swellings due to heat					1		1	1			1
Malvaceae	<i>Malva parviflora</i> L.	17787	I	K	Purification, wound healing, diuretic, inflammations			1			1		1			
Malvaceae	<i>Malva sylvestris</i> L.	18147	-	K	Infections, ulcers, cysts, tumors, cancer, allergies, nerves, blood purification, circulation		1	1					1	1		
Malvaceae	<i>Malvaviscus arboreus</i> Cav.	17963	-	K	Gastritis, ulcers, infections, inflammations, white vaginal flux					1		1	1			
Malvaceae	<i>Malvaviscus arboreus</i> Cav.	17933	-	K	Inflammations, burnings, wound healing								1			
Malvaceae	<i>Malvaviscus arboreus</i> Cav.	18451	-	Q	Diabetes			1								
Malvaceae	<i>Malvaviscus arboreus</i> var. <i>mexicanus</i> Schltld.	18000	-	K	Pancreas, veins & arteries, blood purification		1	1		1						
Malvaceae	<i>Mortoniiodendron guatemalense</i> Standl. & Steyerm.	SN	-	Q	Facilitate delivery, problems of uterus								1			
Malvaceae	<i>Pavonia rosea</i> Wall. ex Moris	18413	-	Q	Psoriasis			1					1			
Malvaceae	<i>Pavonia schiedeana</i> Steud.	18427	-	Q	Cleans uterus, bad breath								1			1
Malvaceae	<i>Sida acuta</i> Burm.f.	18139	-	K	Uterus, hair loss, kidney & bladder stones, stomach issues					1	1	1				1
Malvaceae	<i>Sida acuta</i> Burm.f.	18389, 17847, 18089 (VW)	-	Q	Delaying down delivery								1			
Malvaceae	<i>Sida acuta</i> Burm.f.	18089	-	Q	Skin problems: 'bultos' with pus									1		
Malvaceae	<i>Sida acuta</i> Burm.f.	17847	-	Q	Skin problems: 'nacidos'									1		
Malvaceae	<i>Sida acuta</i> Burm.f.	18389	-	Q	Colic, gastritis, trigger delivery					1		1				

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Malvaceae	<i>Sida rhombifolia</i> L.	17897	- K	Gastritis, ulcers, inflammations, infections, hair loss, dandruff, cough				1	1			1			1
Malvaceae	<i>Sida rhombifolia</i> L.	17807	- K	Fever, blood purification, expectorant			1	1	1						1
Malvaceae	<i>Theobroma cacao</i> L.	L	- K	Sacred, anemia, malnutrition			1							1	
Malvaceae	<i>Theobroma cacao</i> L.	L	- Q	Children problem: 'numay'											1
Malvaceae	<i>Theobroma cacao</i> L.	L	- Q												
Malvaceae	<i>Tilia platyphyllos</i> Scop.	L	I K	Relaxant										1	
Malvaceae	<i>Tilia platyphyllos</i> Scop.	L	I K	Gastritis, ulcers, inflammations, infections, nerves, muscular cramps, epilepsy, uterus, urinary issues, tranquilizing	1				1	1	1	1	1		
Malvaceae	<i>Tilia platyphyllos</i> Scop.	L	I K	Nerves, tonic, analgesic, diuretic			1			1			1		
Malvaceae	<i>Tilia platyphyllos</i> Scop.	L	I K	Sleeplessness, nervous system, problems of blood pressure, tranquilizing, blood purification		1	1						1		
Malvaceae	<i>Triumfetta bogotensis</i> DC.	17856	- Q	Facilitate delivery, uterus, intestines, white vaginal flux					1		1				
Maranthaceae	<i>Calathea micans</i> (L.Mathieu) Körn.	17981	- Q	Abortive								1			
Maranthaceae	<i>Calathea</i> sp.	18313	- Q	Washes uterus, cleans menstruation								1			
Maranthaceae	<i>Stromanthe jacquinii</i> (Roem. & Schult.) H.A.Kenn. & Nicolson	18125	- Q	Uterus								1			
Martyniaceae	<i>Martynia annua</i> L.	18317	N Q	Gastritis, vaginal bleeding					1		1				

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Melastomataceae	<i>Arthrostemma ciliatum</i> Pav. ex D. Don	18046, 18409, 18477, 18343 (VW)	N	Q	Urinary infections in women						1					
Melastomataceae	<i>Arthrostemma ciliatum</i> Pav. ex D. Don	18343	N	Q	Urinary problems						1					
Melastomataceae	<i>Arthrostemma ciliatum</i> Pav. ex D. Don	18046, 18409, 18477, 18343 (VW)	N	Q	Pain during urination						1					
Melastomataceae	<i>Arthrostemma ciliatum</i> Pav. ex D. Don	18046, 18409, 18477	N	Q	Prostate, urine problems, itching, ulcers - 'sankh', toothache						1	1	1			
Melastomataceae	<i>Arthrostemma ciliatum</i> Pav. ex D. Don	18046, 18409, 18477, 18343 (VW)	N	Q	Prostate							1				
Melastomataceae	<i>Arthrostemma parvifolium</i> Cogn.	18415	N	Q	Gastritis, ulcers, diabetes			1		1			1			
Melastomataceae	<i>Arthrostemma parvifolium</i> Cogn.	SN	N	Q	Back pain, headache	1								1		
Melastomataceae	<i>Blakea sp.</i>	18171	-	Q	Fire in the stomach					1						
Melastomataceae	<i>Heterocentron</i> <i>subtriplinervium</i> (Link & Otto) A. Braun & C.D. Bouché	17766	N	K	Purification, digestion			1		1						
Melastomataceae	<i>Heterocentron</i> <i>subtriplinervium</i> (Link & Otto) A. Braun & C.D. Bouché	18136	N	K	Uric acid, hemorrhagias, colesterol, blood toxins, blood purification, liver functioning, lung problems, diabetes			1	1	1	1					
Melastomataceae	<i>Miconia calvescens</i> DC.	18476	N	Q	Uterus, vaginal bleeding, analgesic							1				
Melastomataceae	<i>Miconia oinochrophylla</i> Donn.Sm.	18014	N	Q	Menstrual problems, fever							1				1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Melastomataceae	<i>Miconia oinochrophylla</i> Donn.Sm.	18478	N	Q	Uterine cancer, uterine bleeding, prevent pregnancies, analgesic							1	1	1		
Melastomataceae	<i>Miconia sp.</i>	18271	-	Q	Wounds, hemorrhagias			1					1			
Melastomataceae	<i>Miconia sp.</i>	17839	-	Q	Stomach pain, fever, headache					1				1		1
Melastomataceae	<i>Miconia sp.</i>	18144	-	Q	Fever											1
Melastomataceae	<i>Mouriri sp.</i>	18459	-	Q	Dysentery, snake bites					1						1
Melastomataceae	<i>Topobea watsonii</i> Cogn.	18268	N	Q	Gastritis					1						
Melastomataceae	<i>Topobea watsonii</i> Cogn.	18282	N	Q	Hiccup	1				1						1
Melastomataceae		18171, 18282 (VW)	-	Q	Breast pain, headache							1		1		
Melastomataceae		SN	-	Q	Bone ache, body ache	1								1		
Meliaceae	<i>Cedrela odorata</i> L.	18069	-	K	Hemorrhoides, swollen veins, uric acid, arthritis	1	1				1				1	
Meliaceae	<i>Cedrela odorata</i> L.	17889	-	K	Headaches due to menstruation							1				
Meliaceae	<i>Cedrela odorata</i> L.	18069, 17889 (VW)	-	Q	Fungi								1			
Meliaceae	<i>Cedrela salvadorensis</i> Standl.	18454	-	K	Blood purification, allergies, internal infections, skin pustules - 'granos'			1					1			
Menispermaceae	<i>Cissampelos sp.</i>	18336	-	Q	Tension, itching in the face - 'hormigüea en la cara'										1	
Monimiaceae	<i>Peumus boldus</i> Mol.	L	I	K	Blood purification, depressions, liver issues, digestive, wound healing, inflammations			1		1			1	1		
Monimiaceae	<i>Peumus boldus</i> Mol.	L	I	K	Kidneys, liver, kidney stones, nerves, intestinal pain, stomach pain					1	1			1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Moraceae	<i>Cecropia peltata</i> L.	18357	N	Q	Enhance female fertility							1				
Moraceae	<i>Dorstenia contrajerva</i> L.	18230	N	Q	Tumors, 'granos', 'sankh', 'hormiguillo', snake bites								1			1
Moraceae	<i>Dorstenia lindeniana</i> Bureau	17910	N	Q	Fungi, 'mai'								1			
Moraceae	<i>Dorstenia lindeniana</i> Bureau	18324	N	Q	Fungi								1			
Moraceae	<i>Dorstenia lindeniana</i> Bureau	17865, 18361, 18251	N	Q	Skin problems: 'ronchas', frog poisons								1			1
Moraceae	<i>Ficus carica</i> L.	17822	I	K	Cough, respiratory problems, antibiotic				1				1			
Moraceae	<i>Ficus carica</i> L.	17978	I	K	Cough, asthma, bronchitis, varicose veins, shivering, arthritis, rheumatism	1	1		1							
Moraceae	<i>Ficus insipida</i> Willd.	L	N	Q	Cancer, analgesic, wound healing								1	1		
Moraceae	<i>Trophis mexicana</i> (Liebm.) Bureau	18263	N	Q	Menstruation, wounds, cancer							1	1			
Moringaceae	<i>Moringa oleifera</i> Lam.	L	I	K	Inflammations, diabetes, colon			1		1			1			
Moringaceae	<i>Moringa oleifera</i> Lam.	L	I	Q	Diabetes			1								
Musaceae	<i>Musa × paradisiaca</i> L.	L	N	K	Tonic			1								
Musaceae	<i>Musa × paradisiaca</i> L.	L	N	Q	Cholera					1						
Musaceae	<i>Musa × paradisiaca</i> L.	L	N	Q	Antibiotic, ulcers, leishmaniosis - 'mosca chiclera'								1			
Musaceae	<i>Musa × paradisiaca</i> L.	18405	N	Q	Hepatitis					1						
Myrtaceae	<i>Callistemon citrinus</i> (Curtis) Skeels	17741	-	K	Diuretic, destroys kidney stones, purification			1			1					
Myrtaceae	<i>Eucalyptus cinerea</i> F.Muell. ex Benth.	18297	I	K	Lungs problems, antibiotic, sacred, relaxative				1				1	1	1	
Myrtaceae	<i>Eucalyptus cinerea</i> F.Muell. ex Benth.	17988	I	K	Influenza, cough, lesions due to hits, stimulant, expectorant	1		1	1							

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Myrtaceae	<i>Eucalyptus cinerea</i> F.Muell. ex Benth.	18297, 17988 (VW)	I	K												
Myrtaceae	<i>Eucalyptus cinerea</i> F.Muell. ex Benth.	18297, 17988 (VW)	I	K	Lungs problems, insect bites, tonsils, infections of the skin, sinusitis, constipation			1	1	1			1			1
Myrtaceae	<i>Eucalyptus cinerea</i> F.Muell. ex Benth.	18297, 17988 (VW)	I	Q	Asthma				1							
Myrtaceae	<i>Pimenta dioica</i> (L.) Merr.	L	N	K	Lesions, arthritis, stomach issues, purgative	1				1						
Myrtaceae	<i>Pimenta dioica</i> (L.) Merr.	18273	N	Q	Prevent pregnancies							1				
Myrtaceae	<i>Psidium guajava</i> L.	17956	N	K	Tonic, gastritis, intestinal inflammations, colic, vomiting, diarrhea			1	1	1						
Myrtaceae	<i>Psidium guajava</i> L.	17956 (VW)	N	K	Nervous problems, uric acid, cholesterol, blood toxins			1			1			1		
Myrtaceae	<i>Psidium guajava</i> L.	17956 (VW)	N	Q	Fungi								1			
Myrtaceae	<i>Psidium guajava</i> L.	17956 (VW)	N	Q	Stomach ache, dysentery					1						
Myrtaceae	<i>Psidium guajava</i> L.	17956 (VW)	N	Q	Dysentery, diarrhea					1						
Myrtaceae		18461	-	Q	Muteness, strokes									1		
Nephrolepidaceae	<i>Nephrolepis undulata</i> (Afzel. ex Sw.) J. Sm.	18196	N	K	Cancer, infections, cysts, ulcers, tumors, parasites					1			1			
Nyctaginaceae	<i>Bougainvillea glabra</i> Choisy	18187	-	K	Expectorant, antibiotic, pulmonary and bronchial problems				1				1			
Nyctaginaceae	<i>Bougainvillea glabra</i> Choisy	18187 (VW)	-	K	Cough, expectorant				1							
Nyctaginaceae	<i>Nymphaea ampla</i> (Salisb.) DC.	18245	-	Q	Uterine cramps							1				
Oleaceae	<i>Olea europaea</i> L.	L	-	K	Purgative					1						

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Oleaceae	<i>Olea europaea</i> L.	L	-	K	Purgative					1						
Oleaceae	<i>Olea europaea</i> L.	L	-	K	Purgative, digestive					1						
Onagraceae	<i>Fuchsia hybrida</i> hort. ex Siebert & Voss	18384	-	K	Infections								1			
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	18179	N	Q	Hepatitis, uterine cancer					1		1	1			
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	17901, 18341	N	Q	Vomiting & diarrhea in children, fever					1			1			1
Onagraceae	<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	18304	N	Q	Uterus, menstruation							1				
Onagraceae	<i>Oenothera pubescens</i> Willd. ex Spreng.	18417	N	K	Stomach problems, digestion, respiratory problems, inflammations				1	1			1			
Orchidaceae	<i>Barkeria skinneri</i> (Bateman ex Lindl.) Paxton	18397	-	K	Diuretic						1					
Orchidaceae	<i>Calanthe calanthoides</i> (A.Rich. & Galeotti) Hamer & Garay	18312	-	K	Wounds, ulcers, gastritis, tumors, hernias, biliary problems, colic, inflammation of kidneys	1				1			1			
Orchidaceae	<i>Campylocentrum micranthum</i> (Lindl.) Rolfe	18133	-	Q	Cancer, red swellings, pain								1			
Orchidaceae	<i>Odontoglossum sp.</i> / <i>Oncidium sp.</i>	SN	-	Q	Skin problems: 'nacidos'								1			
Orchidaceae	<i>Oeceoclades maculata</i> (Lindl.) Lindl	17866	-	Q	Snake bites											1
Orchidaceae	<i>Oeceoclades maculata</i> (Lindl.) Lindl	18202	-	Q	Animal bites, ulcers, antibiotic, tumors, leishmaniosis - 'mosca chiclera'								1			1
Orchidaceae	<i>Oncidium sp.</i>	SN	-	Q	Uterus problems							1				

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Orchidaceae	<i>Ornithocephalus inflexus</i> Lindl.	18129	-	Q	Cancer, skin problems: 'mai, granos'								1			
Oxalidaceae	<i>Oxalis corniculata</i> L.	17972	N	K	Gastritis, ulcers, vaginal fluxes, hemorrhoides, inflammations, infections					1		1	1			
Oxalidaceae	<i>Oxalis corniculata</i> L.	18003, 18153	N	K	Protects tissue, stress, headache, nervous system, ulcers, wound healing, gastritis, blood purification, eye view	1		1		1			1	1		1
Oxalidaceae	<i>Oxalis divergens</i> Benth. ex Lindl.	17922	-	K	Eye infections											1
Oxalidaceae	<i>Oxalis divergens</i> Benth. ex Lindl.	18151	-	K	Uric acid, gastritis, bilis, stress, headache, nervous system, ulcers, wound healing, gastritis, blood purification			1		1	1		1	1		
Papaveraceae	<i>Argemone mexicana</i> L.	18068, 18103	-	K	Eye cataracts, analgesic, desinflammant								1	1		1
Papaveraceae	<i>Bocconia arborea</i> S.Watson	17957	-	K	Toothache, nerves									1		1
Passifloraceae	<i>Passiflora coriacea</i> Juss.	17883 (VW)	-	Q	Analgesic, antidote, wound healing	1							1	1		1
Passifloraceae	<i>Passiflora coriacea</i> Juss.	17883	-	Q	Sudden death', epilepsy, 'cramps in the face'									1		
Passifloraceae	<i>Passiflora edulis</i> Sims	18344 (VW)	I	K												
Passifloraceae	<i>Passiflora edulis</i> Sims	18344	I	Q	Cough, influenza, fever, ulcers				1				1			1
Passifloraceae	<i>Passiflora hahnii</i> (E.Fourn.) Mast.	18440	-	Q	Hiccup											1
Passifloraceae	<i>Passiflora hahnii</i> (E.Fourn.) Mast.	18328, 18485	-	Q	Prostate, urinary issues, gastritis, headache, strokes					1	1	1		1		

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Piperaceae	<i>Piper auritum</i> Kunth	18172	- Q	Rheumatism, cramps, uterus	1						1				
Piperaceae	<i>Piper auritum</i> Kunth	18355	- Q	Dislocations	1										
Piperaceae	<i>Piper hispidum</i> Sw.	18259	- Q	Headache, craziness									1		
Piperaceae	<i>Piper Jacquemontianum</i> Kunth	SN	- K	gastritis, ulcers, fever, inflammation, infection, swellings due to heat, white vaginal flux					1		1	1			1
Piperaceae	<i>Piper Jacquemontianum</i> Kunth	18431	- Q	Bad spirits										1	
Piperaceae	<i>Piper Jacquemontianum</i> Kunth	18431, 17864 (VW)	- Q	Gastritis					1						
Piperaceae	<i>Piper Jacquemontianum</i> Kunth	17864	- Q	Post-delivery care, fever, uterus, epilepsy, 'sudden death', poisons							1		1		1
Piperaceae	<i>Piper marginatum</i> Jacq.	18242	- Q	Swellings due to shock 'susto'									1		
Piperaceae	<i>Piper nigrum</i> L.	SN	- Q												
Piperaceae	<i>Piper peltatum</i> L.	18232	- Q	Allergies, diarrhea			1		1						
Piperaceae	<i>Piper peltatum</i> L.	18340	- Q	Hemorrhagia vaginal, diarrhea, skin problems: 'granos', infections, menstrual problems			1		1		1	1			
Piperaceae	<i>Piper peltatum</i> L.	18320	- Q	Allergies			1								
Piperaceae	<i>Piper peltatum</i> L.	18276	- Q	Uterus, body pain	1						1				
Piperaceae	<i>Piper peltatum</i> L.	18356	- Q	Bad spirits causing constipation and urinary problems					1	1				1	
Piperaceae	<i>Piper pseudofulgineum</i> C.DC.	18395	- Q	Stroke, 'el tzuul'									1		
Piperaceae	<i>Piper pseudofulgineum</i> C.DC.	18310	- Q	Itching' in the body	1										
Piperaceae	<i>Piper sp.</i>	18266	- Q	Shocks 'espanto', post-delivery care, fractures	1						1		1		

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Piperaceae	<i>Piper sp.</i>	18051	- Q	Uterine pain, intestinal pain					1		1		1		
Piperaceae	<i>Piper sp.</i>	18210	- Q	Chills, colds, fever				1							1
Piperaceae	<i>Piper tuerckheimii</i> C.DC.	18402	- Q	Menstruation							1				
Piperaceae	<i>Piper tuerckheimii</i> C.DC.	SN	- Q	Wound healing, antibiotic								1			1
Piperaceae	<i>Piper tuerckheimii</i> C.DC.	18442	- Q	Dengue, hemorrhagias, fever, epilepsy, 'sudden death', post-delivery care, poisons			1				1	1	1		1
Piperaceae	<i>Piper tuerckheimii</i> C.DC.	18209	- Q	Bad spirits causing constipation and urinary issues					1	1	1				
Piperaceae	<i>Piper uhdei</i> C.DC.	18023, 18024, 17775 (VW)	- K	Allergies, bronchial problems			1	1							
Piperaceae	<i>Piper uhdei</i> C.DC.	17775	- K	Blood purification, wound healing, coagulation			1					1			
Piperaceae	<i>Piper uhdei</i> C.DC.	18023, 18024	- K	Cancer, tumors, cysts, ulcers								1		1	
Piperaceae	<i>Piper umbellatum</i> L.	18185	- K	Parasites					1						
Piperaceae	<i>Piper veraguense</i> C.DC.	17983, 18432	- Q	Menstrual problems							1				
Piperaceae	<i>Piper veraguense</i> C.DC.	17983	- Q	Body pain, uterine pain, fever, anemia, cold limbs, toothache, menstrual pain	1		1				1				1
Piperaceae	<i>Piper veraguense</i> C.DC.	18432	- Q	Vomiting					1						
Piperaceae	<i>Piper yzabalanum</i> C.DC. ex Donn.Sm.	18213	- Q	Cramps, rheumatism	1										
Piperaceae	<i>Piper yzabalanum</i> C.DC. ex Donn.Sm.	18322	- Q	Headache									1		
Plantaginaceae	<i>Digitalis purpurea</i> L.	17761	I K	Cardiotonic, heart problems, arteriosclerosis, cleans arteries, dissolves fat		1	1								
Plantaginaceae	<i>Plantago major</i> L.	18043	I K	Destroys tissue 'masas'								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Plantaginaceae	<i>Plantago major</i> L.	18170	I	K	Gastritis, ulcers, inflammation, infection, wounds, ulcers, skin problems: 'granos', blood circulation, blood purification, lesions, parasites, fractures, white vaginal flux	1	1	1		1		1	1			1
Plantaginaceae	<i>Plantago major</i> L.	17739	I	K	Purification, diuretic, inflammations, wound healing			1			1		1			
Plantaginaceae	<i>Plantago major</i> L.	18112	I	K	Cancer, inflammation, uric acid, gastritis, ulcers, diabetes, stomach problems, nervous problems, analgesic, skin problems: 'granos', allergies, blood circulation		1	1		1	1		1	1		
Plantaginaceae	<i>Plantago major</i> L.	18043, 18170, 17739, 18112 (VW)	I	Q	Stomach ache					1						
Plantaginaceae	<i>Scoparia dulcis</i> L.	18062	N	Q	Diarrhea, vomiting, snakebites					1						1
Plantaginaceae	<i>Veronica sp.</i>	18152	-	K	Eye problems, stress, headache, nervous system, ulcers, wound healing, gastritis, blood purification, acidity in the throat, muscular tissue	1		1		1	1		1	1		1
Poaceae	<i>Arundinella deppeana</i> Nees	SN	N	Q	Balance energies, diabetes, tumors, hernias			1		1			1		1	
Poaceae	<i>Arundo donax</i> L.	17823	I	K	Sacred, burns malignant cells								1		1	
Poaceae	<i>Avena sativa</i> L.	L	I	K	Fibers					1						
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	18293	I	K	High blood pressure, uterine cysts		1					1				

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	18293 (VW)	I	K	Improve blood circulation, heart problems, tranquilizing, purification, expectorant		1	1	1					1		
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	18293 (VW)	I	K	Reduce blood sugar level, fever, digestive, facilitating circulation, blood purification, diabetes		1	1		1						1
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	18293 (VW)	I	Q	Blood pressure problems		1									
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	18293 (VW)	I	Q	Blood pressure problems		1									
Poaceae	<i>Hordeum vulgare</i> L.	L	I	K	Tonic, diuretic, prostate, water retention in tissue, kidney and bladder infections, inflammations, ulcers, lesions, fever	1		1			1		1			1
Poaceae	<i>Olyra latifolia</i> L.	18375	N	Q	Clean, and normalizes uterus							1				
Poaceae	<i>Oryza sativa</i> L.	L	-	K	Inflammations								1			
Poaceae	<i>Phalaris canariensis</i> L.	L	I	K	Constipation					1						
Poaceae	<i>Phalaris canariensis</i> L.	L	I	K	Inflammations, wound healing, tonic			1					1			
Poaceae	<i>Rhipidocladum pittieri</i> (Hack.) McClure	17900	N	K	Diuretic, uric acid, stimulates urinary excretion						1					
Poaceae	<i>Setaria parviflora</i> (Poir.) M.Kerguelen	18216	N	Q	Menstruation							1				
Poaceae	<i>Zea mays</i> L.	L	N	K	Inflammations, balance hormones, analgesic, fibres			1		1			1	1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Poaceae	<i>Zea mays</i> L.	L	N	K	Tumors, lesions due to hits, nervous system, kidney stones, prostate, urinary problems, gastritis, ulcers, inflammation, infections, diuretic, water retention in tissues	1				1	1	1	1	1		
Poaceae	<i>Zea mays</i> L.	L	N	K												
Poaceae	<i>Zea mays</i> L.	L	N	Q	Diarrhea, vomiting, parasites					1						
Polygonaceae	<i>Persicaria glabra</i> (Willd.) M.Gómez	17749	-	K	Diuretic, purification, stones in kidney and liver			1		1	1					
Polygonaceae	<i>Persicaria glabra</i> (Willd.) M.Gómez	18176	-	Q	Bad breath, bone pain, pregnant women	1						1				1
Polygonaceae	<i>Polygonum sp.</i>	18022	-	K	Stones in kidney & bladder, stomach issues					1	1					
Polygonaceae	<i>Rheum rhaponticum</i> L.	17757	-	K	Purgative, blood purification, digestive, cardiogenic		1	1		1						
Polygonaceae	<i>Rumex crispus</i> L.	18099	-	K	Inflammations, diuretic						1		1			
Polygonaceae	<i>Rumex crispus</i> L.	17942	-	K	Wound healing, antibiotic, inflammations, menstrual problems							1	1			
Polygonaceae	<i>Rumex obtusifolius</i> L.	18158	-	K	Skin infection, inflammations of pancreas & liver, bilis					1			1			
Polypodiaceae	<i>Phlebodium decumanum</i> (Willd.) J. Sm.	17846	N	Q	Epilepsy, attacks									1		
Polypodiaceae	<i>Phlebodium pseudoaureum</i> (Cav.) Lellinger	18309	N	K	Cancer, tumors, ulcers, mastitis, gastric ulcers, hernias, cysts, infections					1		1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Polypodiaceae	<i>Pleopeltis angusta</i> Humb. & Bonpl. ex Willd.	17880	N	K	lesions due to hits, arthritis, blood purification, diuretic, prostate, water retention in tissues, kidney & bladder infections	1		1			1					
Polypodiaceae	<i>Pleopeltis angusta</i> Humb. & Bonpl. ex Willd.	18156	N	K	Circulatory problems, nerves		1							1		
Polypodiaceae	<i>Polypodium echinolepis</i> Fée	18070	N	K	Uterine infections, bladder, colon					1		1				
Polypodiaceae	<i>Polypodium echinolepis</i> Fée	17895	N	K	Gastritis, ulcers, inflammation, infection, wounds, lesions due to hits, arthritis, nerves, diabetes	1		1		1			1	1		
Polypodiaceae	<i>Polypodium echinolepis</i> Fée	17740	N	K	Diuretic, blood coagulation, wound healing, kidneys, skin purification			1			1		1			
Polypodiaceae	<i>Polypodium polypodioides</i> (L.) Watt	17991	N	K	Cancer, nerves, arthritis, parasites, headache, stress, cartilages, varicose veins, uric acid, sleeplessness	1	1			1	1			1		
Pontederiaceae	<i>Pontederia cordata</i> L.	18180	-	Q	Hepatitis, uterus, kidneys, lungs				1	1	1	1				
Portulacaceae	<i>Portulaca oleracea</i> L.	17925	-	K	Parasites, nutrition					1						1
Portulacaceae	<i>Portulaca oleracea</i> L.	17925 (VW)	-	K	Tumors, gastritis, ulcers, inflammations, infections, skin problems: 'granos', diuretic, prostate, water retention in tissues, kidney and urinary infections, parasites					1	1	1	1			
Primulaceae	<i>Parathesis</i> sp.	18097	-	K	Pancreas, cysts, antibiotic					1			1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rosaceae	<i>Crataegus gracilior</i> J.B.Phipps	18161	-	K	Blood circulation, impotence, gastritis, ulcers, nervous system, digestive issues, blood purification, colon, infections, cysts, hernias		1	1		1		1	1	1		
Rosaceae	<i>Cydonia oblonga</i> Mill.	L	N	K	Sacred, diuretic						1				1	
Rosaceae	<i>Cydonia oblonga</i> Mill.	L	N	K	Teach bad spirits, spiritual cleansing, nervous system, uric acid, cholesterol, allergies, skin infections, wound healing, internal infections, cysts			1		1	1	1	1	1	1	
Rosaceae	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	18376	I	K	Antibiotic, inflammations								1			
Rosaceae	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	18008	I	K	Gastritis, ulcers, inflammation of kidney & liver, infections, swellings due to heat, white vaginal flux					1	1	1	1			1
Rosaceae	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	18376, 18008 (VW)	I	K												
Rosaceae	<i>Eriobotrya japonica</i> (Thunb.) Lindl.	18376, 18008 (VW)	I	K	Pancreas, liver, kidneys, gastritis, pulmonary problems, diabetes			1	1	1	1					
Rosaceae	<i>Malus sp.</i>	L	-	K	Sacred										1	
Rosaceae	<i>Malus sp.</i>	L	-	K	Digestion, gastritis, diarrhea, constipation, eye problems, respiratory problems, fever				1	1						1
Rosaceae	<i>Prunus domestica</i> L.	L	I	K	Constipation, intestinal problems					1						
Rosaceae	<i>Prunus persica</i> (L.) Batsch	18381	I	K	Sacred, parasites					1					1	
Rosaceae	<i>Prunus persica</i> (L.) Batsch	17956	I	K	Headache, diarrhea, bronchial problems				1	1				1		

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rosaceae	<i>Prunus persica</i> (L.) Batsch	18381, 17956 (VW)	I	K												
Rosaceae	<i>Prunus persica</i> (L.) Batsch	18381, 17956 (VW)	I	K	Purgative, ulcers, stomach, allergies, skin infections, cancer, cysts			1		1		1	1			
Rosaceae	<i>Rosa sp.</i>	17830	-	K	Sacred, relaxant, nervous problems, strenghten the brain									1	1	
Rosaceae	<i>Rubus adenotrichus</i> Schltldl.	17965	N	K	Fever, influenza, colds				1							1
Rubiaceae	<i>Arachnothryx buddleioides</i> (Benth.) Planch.	SN	N	Q	Epilepsy									1		
Rubiaceae	<i>Blepharidium guatemalense</i> Standl.	18368, 17848 (VW)	N	Q	Ulcers - 'sankh', antibiotic								1			
Rubiaceae	<i>Blepharidium guatemalense</i> Standl.	18368, 17848 (VW)	N	Q	Antibiotico								1			
Rubiaceae	<i>Blepharidium guatemalense</i> Standl.	17848	N	Q	Ulcers - 'sankh'								1			
Rubiaceae	<i>Blepharidium guatemalense</i> Standl.	18368, 17848 (VW)	N	Q	Ulcers								1			
Rubiaceae	<i>Blepharidium guatemalense</i> Standl.	18368	N	Q	Mosca chiclera' - leishmaniosis								1			
Rubiaceae	<i>Bouvardia leiantha</i> Benth.	17809	N	K	Ceremonial, saturations, analgesico, blood purification, decrease blood sugar level, clean wounds			1					1	1	1	
Rubiaceae	<i>Cinchona officinalis</i> L.	SN	I	Q	Dengue, malaria, dysentery, gastritis, ulcers, uterus, diabetes, cancer			1		1		1	1			
Rubiaceae	<i>Coffea arabica</i> L.	18182	I	K	Antibiotic, inflammations, menstrual problems							1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rubiaceae	<i>Coffea arabica</i> L.	17962	I	K	Facilitate delivery, cough, pneumonia, influenza, shivering, headache, body pain	1			1			1		1		
Rubiaceae	<i>Coffea arabica</i> L.	18182, 17962 (VW)	I	Q	External tumors								1			
Rubiaceae	<i>Didymaea microphylla</i> L.O.Williams	18467	N	K	Small arteries & veins: hands that do not feel, arthritis, varicose veins, hernias	1	1						1	1		
Rubiaceae	<i>Exostema mexicanum</i> A.Gray	L	N	K	Cancer, kills cells, antibiotic								1			
Rubiaceae	<i>Exostema mexicanum</i> A.Gray	SN	N	Q	Diabetes			1								
Rubiaceae	<i>Geophila repens</i> (L.) I.M.Johnst.	18374	N	Q	Stomach ache					1						
Rubiaceae	<i>Hamelia axillaris</i> Sw.	18456	N	Q	Fever											1
Rubiaceae	<i>Hamelia patens</i> Jacq.	18269	N	K	Nerves, infections, inflammations, diabetes, gastritis			1		1			1	1		
Rubiaceae	<i>Hamelia patens</i> Jacq.	18243	N	Q	Pneumonia, tuberculosis				1							
Rubiaceae	<i>Hamelia patens</i> Jacq.	18243, 18333, 17871, 18272 (VW)	N	Q	Skin problems: Itching, 'granos'								1			
Rubiaceae	<i>Hamelia patens</i> Jacq.	18333	N	Q												
Rubiaceae	<i>Hamelia patens</i> Jacq.	17871, 18272	N	Q	Skin problems: 'granos, ronchas'								1			
Rubiaceae	<i>Hamelia patens</i> Jacq.	18243, 18333, 17871, 18272 (VW)	N	Q	Antibiotico, llagas, leishmaniosis 'mosca chiclera', tumors, ovarios							1	1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rubiaceae	<i>Hintonia lumaean</i> (Baill.) Bullock	17959	-	K	Fever, diarrhea, vomiting, parasites, influenza, diabetes, stimulate appetite			1	1	1						1
Rubiaceae	<i>Hintonia lumaean</i> (Baill.) Bullock	17959 (VW)	-	K	Diabetes, fever			1								1
Rubiaceae	<i>Morinda citrifolia</i> L.	18204	I	K	Destroy tissue - 'masas'								1			
Rubiaceae	<i>Morinda citrifolia</i> L.	18204 (VW)	I	Q	Diabetes			1								
Rubiaceae	<i>Psychotria flava</i> Oerst. ex Standl.	18443	N	Q	Nose bleeding, stomach inflammations		1			1						
Rubiaceae	<i>Psychotria glomerulata</i> (Donn.Sm.) Steyerl.	18168	N	Q	Epilepsy, fever, headache									1		1
Rubiaceae	<i>Psychotria sp.</i>	18267	-	Q	Menstrual problems							1				
Rubiaceae	<i>Psychotria sp.</i>	18169	-	Q	Epilepsy, fever, headache, pain in the body	1								1		1
Rubiaceae	<i>Psychotria sp.</i>	18183	-	Q	Vaginal bleeding, menstruation							1				
Rubiaceae	<i>Psychotria tenuifolia</i> Sw.	17906	N	Q	Cancer, pain in bones, body and head	1							1	1		
Rubiaceae	<i>Psychotria tenuifolia</i> Sw.	17906 (VW)	N	Q	Ulcers								1			
Rubiaceae	<i>Richardia scabra</i> L.	SN	N	K	Inflammations of bones	1										
Rubiaceae	<i>Richardia scabra</i> L.	17751	N	K	Purification, heart issues, cardiotonic, dissolves fat in arteries		1	1								
Rubiaceae	<i>Spermacoce ocymoides</i> Burm.f.	18077	N	K	Ovarian cysts, uterus, menstruation, placenta							1				
Rubiaceae	<i>Spermacoce ocymoides</i> Burm.f.	18302	N	Q	Colic					1						

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rubiaceae		18484	-	Q	Sacred, gastritis, cancer, ulcers, eye problems, vaginal bleeding, uterus					1		1	1			1
Rutaceae	<i>Casimiroa edulis</i> La Llave	SN	N	K	Blood purification			1								
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17829	I	K	Nervous problems, stomach problems, relaxant, strenghten brain					1				1		
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17987	I	K	Cough, antidote, alcoholism, shivering, ulcers, lesions, inflammed tissue, purgative	1			1	1			1			1
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17785	I	K	Blood purification, cardi tonic, diuretic, stimulant		1	1			1					
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17829, 17987, 17785 (VW)	I	K	Increase liquid in the blood, blood purification, colesterol, varicose veins, cartilages, arthritis, obesity	1	1	1								
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17829, 17987, 17785 (VW)	I	Q	Asthma, 'granos' in mouth and throat				1	1			1			
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17829, 17987, 17785 (VW)	I	Q	Abortive							1				
Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	17829, 17987, 17785 (VW)	I	Q	Induce delivery, black magic							1			1	
Rutaceae	<i>Citrus aurantium</i> L.	18004 (VW)	I	K	Blood sugar level, nervous system, bronchial problems			1	1					1		
Rutaceae	<i>Citrus aurantium</i> L.	18004	I	K	Cough, influenza, body pain, nerves, lesion due to hits, arthritis, cramps, epilepsy, uterus, bilis, urinary problems, fever, blood sugar level, bronchial problems	1			1	1	1	1		1		1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rutaceae	<i>Citrus aurantium</i> L.	18004 (VW)	I	K	Purification, inflammations, tonic, wound healing, nerves, purgative			1					1	1		
Rutaceae	<i>Citrus aurantium</i> L.	18004 (VW)	I	K	Strengthen the blood, tonic, diabetes, uric acid			1			1					
Rutaceae	<i>Citrus limon</i> (L.) Osbeck.	18054	-	Q	Energetic problem: 'mal de ojo', conjunctivitis										1	1
Rutaceae	<i>Citrus maxima</i> (Burm.) Merr.	18009 (VW)	-	K	Diabetes			1								
Rutaceae	<i>Citrus maxima</i> (Burm.) Merr.	18009	-	K	Diabetes, inflammation of liver & kidney, inflammations, infections			1		1	1		1			
Rutaceae	<i>Citrus maxima</i> (Burm.) Merr.	18009 (VW)	-	K	Strengthen the blood, uric acid			1			1					
Rutaceae	<i>Citrus reticulata</i> Blanco	17954	-	K	Cough				1							
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck.	17989 (VW)	-	K	Purgative, allergies			1		1						
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck.	17989	-	K	Cough, malaria, parasites, nerves, inflammations, ulcers, lesions, 'granos', stomach problems, fever	1			1	1			1	1		1
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck.	17989 (VW)	-	K	Strengthen the blood, uric acid, tonic - vitamin c			1			1					
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck.	17989 (VW)	-	Q	Lungs, body pain	1			1							
Rutaceae	<i>Citrus sp.</i>	L	-	K	Blood sugar level			1								
Rutaceae	<i>Citrus sp.</i>	L	-	K	Eye cataracts, red eye, nervous excitation, stress, blood purification, uric acid, cholesterol, blood toxins			1		1	1			1		1
Rutaceae	<i>Ruta chalepensis</i> L.	17824, 18044	I	K	Sacred, high blood pressure		1								1	
Rutaceae	<i>Ruta chalepensis</i> L.	17824, 18044, 17781 (VW)	I	K	Diarrhea, vomiting, energetic problem: 'mal de ojo', menstruation, stomach issues, parasites					1		1			1	

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Rutaceae	<i>Ruta chalepensis</i> L.	17781	I	K	Blood purification, cardi tonic, analgesic, ceremonial		1	1						1	1	
Saliaceae	<i>Salix sp.</i>	18416 (VW)	-	K	Tonic			1								
Saliaceae	<i>Salix sp.</i>	18416 (VW)	-	K	Analgesic, inflammations, purification, headache, muscle ache, bone ache, analgesic	1		1					1	1		
Saliaceae	<i>Salix sp.</i>	18416	-	K	Uric acid, facilitates urination, diuretic, rheumatism, water retention in tissues, blood circulation		1				1					
Santalaceae	<i>Phoradendron quadrangulare</i> (Kunth) Griseb.	17952	N	K	Parasites, problems of blood pressure, nerves, purgative		1			1				1		
Santalaceae	<i>Phoradendron tonduzii</i> Trelease	17804	N	K	Purification, cardi tonic, wound healing, inflammations, rubefacient		1	1		1			1			
Sapotaceae	<i>Sideroxylon capiri</i> (A.DC.) Pittier	L	-	K	Blood circulation, inflammations		1						1			
Schisandraceae	<i>Illicium verum</i> Hook.f.	SN	I	K	Stimulant, relaxative, cleaning veins & arteries		1	1						1		
Scrophulariaceae	<i>Verbascum thapsus</i> L.	L	-	K	Uterus, sacred, strengthen the brain, inflammations							1	1	1	1	
Scrophulariaceae	<i>Verbascum thapsus</i> L.	L	-	K	Gastritis, ulcers, inflammations, infections of kidney & liver, anemia			1		1	1		1			
Scrophulariaceae	<i>Verbascum thapsus</i> L.	17805	-	K	Fever, blood purification, expectorant, hemorrhagias, wound healing			1	1				1			1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Selaginellaceae	<i>Selaginella pallescens</i> (C. Presl) Spring	18113	N	K	Insect bites, dog bites, rabies, internal infections, cysts, tumors, gastric ulcers, colon infections, uterus, prostate					1		1	1			1
Selaginellaceae	<i>Selaginella sp.</i>	17868	-	Q	Epilepsy, attacks									1		
Siparunaceae	<i>Siparuna thecaphora</i> (Poepp. & Endl.) A.DC.	17994	-	Q	Headache, fever, eye infections									1		1
Siparunaceae	<i>Siparuna thecaphora</i> (Poepp. & Endl.) A.DC.	17851	-	Q	Swellings, anemia, muscular problems	1		1					1			
Siparunaceae	<i>Siparuna thecaphora</i> (Poepp. & Endl.) A.DC.	17860, 18471	-	Q	Cramps	1										
Siparunaceae	<i>Siparuna thecaphora</i> (Poepp. & Endl.) A.DC.	17994, 17851, 17860, 18471 (VW)	-	Q	Fever, cough				1							1
Smilacaceae	<i>Smilax domingensis</i> Willd.	18012	N	K	Blood purification, diabetes, uric acid, fungi, blood problems			1			1		1			
Smilacaceae	<i>Smilax domingensis</i> Willd.	18195	N	K	Cancer, cysts, ulcers, tumors, mastitis, wound healing, kills cells, allergies, infections, blood purification, uric acid, cholesterol			1			1	1	1			
Smilacaceae	<i>Smilax moranensis</i> M.Martens & Galeotti	18391	N	K	Cancer, cysts, ulcers, tumors, mastitis, wound healing, kills cells, allergies, infections, blood purification, uric acid, cholesterol			1			1	1	1			
Smilacaceae	<i>Smilax sp.</i>	18012, 18195, 18391, 17737 (VW)	-	K	Inflammations								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Smilacaceae	<i>Smilax sp.</i>	18012, 18195, 18391, 17737 (VW)	-	Q	Blood purification, skin problems: 'granos'			1					1			
Smilacaceae	<i>Smilax spinosa</i> Mill.	17737	N	K	Blood purification, tonic, wound healing, ulcers, swellings due to heat			1					1			
Solanaceae	<i>Acnistus arborescens</i> (L.) Schltdl.	18481	-	Q	Stomach ache, gastritis, ulcer					1			1			
Solanaceae	<i>Brachistus stramonifolius</i> (Kunth) Miers	17893	-	K	Diabetes, parasites, diarrhea			1		1						
Solanaceae	<i>Capsicum annuum</i> L.	L	-	K	Wound healing, ulcers, gastritis, skin infections, stimulate appetite			1		1			1			
Solanaceae	<i>Capsicum annuum</i> L.	18370	-	Q	Energetical problems: children with 'mal de ojo'										1	
Solanaceae	<i>Cestrum aurantiacum</i> Lindl.	18469	-	K	Biliary problems, parasites, digestive problems, ceremonial					1					1	
Solanaceae	<i>Cestrum megalophyllum</i> Dunal	SN	-	Q	Diabetes, inflammation of testicles			1								
Solanaceae	<i>Cestrum nocturnum</i> L.	18227	-	Q	Inflammation of testicles, fever, stomach ache					1		1				1
Solanaceae	<i>Lycianthes synanthera</i> (Sendtn.) Bitter	18470	-	Q	Abscesses, skin problems with pus: 'bultos'	1							1			
Solanaceae	<i>Nicandra physalodes</i> (L.) Gaertn.	17919	-	K	Ulcers in the skin								1			
Solanaceae	<i>Nicotiana tabacum</i> L.	L	-	Q	Cramps, ear infections	1										1
Solanaceae	<i>Nicotiana tabacum</i> L.	L	-	Q	Sanke bites, black magic										1	1
Solanaceae	<i>Physalis philadelphica</i> Lam.	18188	N	K	Antibiotic, wound healing								1			

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Solanaceae	<i>Solanum hartwegii</i> Benth.	18001	-	K	Fractures, lesions due to hits, blood coagulation, menstrual problems, cartilages, nervous system	1		1				1		1		
Solanaceae	<i>Solanum lycopersicum</i> L.	L	-	K	Purgative					1						
Solanaceae	<i>Solanum lycopersicum</i> L.	L	-	Q	Mumps								1			
Solanaceae	<i>Solanum nigrescens</i> M. Martens & Galeotti	17826	N	K	Diabetes			1								
Solanaceae	<i>Solanum nigrescens</i> M. Martens & Galeotti	17896	N	K	Nerves, weakness of the blood, white vaginal flux, ulcers, cough, skin problems: 'granos' wound healing, fever, lesions, tranquilizing, analgesic	1		1	1			1	1	1		1
Solanaceae	<i>Solanum nigrescens</i> M. Martens & Galeotti	17944	N	K	Allergies, inflammations, wound healing, blood purification, anemia, cough			1	1				1			
Solanaceae	<i>Solanum nigrescens</i> M. Martens & Galeotti	18078	N	K	Diabetes, blood circulation, uric acid, colesterol, blood toxins		1	1			1					
Solanaceae	<i>Solanum nigricans</i> M. Martens & Galeotti	18155, 18420	-	K	Diabetes, blood purification, bilis, nervous system, toothache, analgesic			1		1				1		1
Solanaceae	<i>Solanum nudum</i> Dunal	17849	-	Q	Skin problems: 'sankh', 'bultos'								1			
Solanaceae	<i>Solanum nudum</i> Dunal	18211	-	Q	Ulcers, tumors, antibiotoic, leishmaniosis - 'mosca chiclera'								1			
Solanaceae	<i>Solanum</i> sp.	18474	-	Q	Mumps, skin problems: 'nacidos'								1			
Solanaceae	<i>Solanum torvum</i> Sw.	18167, 18124	-	K	Ulcers, clean the liver, parasites, wound healing, inflammation of bones	1				1			1			

Family	Species	Source	O G	Uses	M	C	B	P	D	U	R	T	B	S	O
Solanaceae	<i>Solanum torvum</i> Sw.	18453	- Q	Tumors, nerves								1	1		
Solanaceae	<i>Solanum torvum</i> Sw.	18030	- Q	Cancer, antibiotic, itching								1			
Solanaceae	<i>Solanum torvum</i> Sw.	18359	- Q	Craziness, urinary problems						1			1		
Solanaceae	<i>Solanum tuberosum</i> L.	L	- K	Purgative					1						
Solanaceae	<i>Solanum tuberosum</i> L.	L	- K	Inflammations, ulcers, lesions, 'granos'	1							1			
Solanaceae	<i>Solanum tuberosum</i> L.	L	- Q	Constipation					1						
Solanaceae	<i>Solanum tuerckheimii</i> Greenm.	18367	- Q	Uterine pain, stomach, gastritis					1		1				
Solanaceae		18315	- Q	Gastritis, headache					1				1		
Tectariaceae	<i>Ctenitis excelsa</i> (Desv.) Proctor	18314	N Q	Sweating											1
Tectariaceae	<i>Tectaria heracleifolia</i> (Will.) Underw.	18226	N Q	Strokes									1		
Theaceae	<i>Camellia sinensis</i> (L.) Kuntze	L	- K	Uric acid, colesterol, blood toxins			1			1					
Urticaceae	<i>Cecropia obtusifolia</i> Bertol.	18015	N Q	Ulcers, enhance female fertility							1				1
Urticaceae	<i>Pilea pubescens</i> Liebm.	SN	N Q	Pain, swellings 'bultos' in any part of the body								1	1		1
Urticaceae	<i>Urera caracasana</i> (Jacq.) Gaudich. ex Griseb.	18379	N K	Uric acid, inflammations						1		1			
Urticaceae	<i>Urera caracasana</i> (Jacq.) Gaudich. ex Griseb.	SN	N K	Kidney & bladder stones, uric acid						1					
Urticaceae	<i>Urera caracasana</i> (Jacq.) Gaudich. ex Griseb.	18379 (VW)	N K	Stimulates immune system			1								
Urticaceae	<i>Urera elata</i> (Sw.) Griseb.	18308	N K	Diuretic, purification			1			1					
Urticaceae	<i>Urera elata</i> (Sw.) Griseb.	18414	N Q	Pneumonia					1						
Urticaceae	<i>Urtica dioica</i> L.	L	I K	Stimulate immune system, kidney & bladder stones			1			1					

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Urticaceae	<i>Urtica urens</i> L.	17748	I	K	Blood purification, cardi tonic, epilepsy, skin problems, psychological problems, immunological problems, inflammations		1	1					1	1		
Velloziaceae	<i>Vellozia caudata</i> Mello-Silva	18464	-	Q	Headache									1		
Verbenaceae	<i>Aloysia citriodora</i> Palau	17778	I	K	Digestive, purification, ceremonial, wound healing, stimulant of nerves & stomach			1		1			1	1	1	
Verbenaceae	<i>Aloysia citriodora</i> Palau	17778 (VW)	I	K	Nervous system, digestive, blood purification, colon, blood circulation, nose bleeding, fever		1	1		1				1		1
Verbenaceae	<i>Cornutia pyramidata</i> L.	18236	N	Q	Skin problems: 'granos'								1			
Verbenaceae	<i>Lantana camara</i> L.	18073, 18393	N	K	Increases liquids in the bones, pain in bones, arthritis, rheumatism, analgesic, inflammation	1	1						1	1		
Verbenaceae	<i>Lantana camara</i> L.	17974	N	K	Gastritis, ulcers, urinary inflammations, infections, hernias, prostate, vaginal fluxes, cancer, hemorrhoides					1	1	1	1			
Verbenaceae	<i>Lantana camara</i> L.	18016, 18338	N	Q	Stomach, cough				1	1						
Verbenaceae	<i>Lantana camara</i> L.	18206	N	Q	Limbs without feeling		1									
Verbenaceae	<i>Lantana horrida</i> Kunth	17890	-	K	Gastritis, ulcers, infections, prostate, urinary problems, hernias, vaginal fluxes, cancer, sweating, wounds, fractures	1				1	1	1	1			1
Verbenaceae	<i>Lantana horrida</i> Kunth	18371	-	Q	Limbs without feeling		1									
Verbenaceae	<i>Lantana involucrata</i> L.	18349	N	Q	Fever, constipation					1						1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Verbenaceae	<i>Lantana trifolia</i> L.	SN	N	Q	Diabetes			1								
Verbenaceae	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	17753, 17941, 18031 (VW)	N	K	Intestinal infections, diarrhea					1						
Verbenaceae	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	17753, 17941	N	K	Purification, fever, expectorant, cardiotoxic, stimulating immune system, cardiotoxic, cough		1	1	1					1		1
Verbenaceae	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	17753, 17941, 18031 (VW)	N	K	Pulmonary problems, influenza, fever, energetical cleansing, sacred, cysts, ulcers, cancer				1	1			1		1	1
Verbenaceae	<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	18031	N	Q	Cough, influenza					1						
Verbenaceae	<i>Lippia sp.</i>	17979	-	Q	Cough (in children)					1						
Verbenaceae	<i>Lippia umbellata</i> Cav.	18165, 18079	N	K	Sacred, blood purification, lungs, nervous system, arthritis, influenza, cleansing of bad energies, cysts, ulcers, cancer, fever	1		1	1	1			1	1	1	1
Verbenaceae	<i>Petrea volubilis</i> L.	18181	N	K	Antibiotic, cysts, wound healing					1		1	1			
Verbenaceae	<i>Phyla scaberrima</i> (Juss. ex Pers.) Moldenke	L	N	K	Cough, influenza, diuretic, prostate, water retention in tissues, kidney, bladder & infections, fever				1		1					1
Verbenaceae	<i>Phyla scaberrima</i> (Juss. ex Pers.) Moldenke	18274	N	Q	Sarapion', herpes								1			
Verbenaceae	<i>Priva lappulacea</i> (L.) Pers.	18439	N	Q	Uterine cancer							1	1			
Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	18433	N	Q	Uterus, kidney issues						1	1				
Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	18345	N	Q	Eye problems, shock: 'espanto'		1							1		1

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	18047	N	Q	Parasites					1						
Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	18212	N	Q	Scorpion bites, black magic										1	1
Verbenaceae	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	17858, 18278	N	Q	Fever, malaria								1			1
Verbenaceae	<i>Verbena carolina</i> L.	18045	N	K	Fever											1
Verbenaceae	<i>Verbena litoralis</i> Kunth	17747, 17755, 18076, 18138 (VW)	N	K	Cough, muscular cramps, uterus, urinary problems, bilis, epilepsy, blood purification, fever, tranquilizing	1		1	1	1	1	1		1		1
Verbenaceae	<i>Verbena litoralis</i> Kunth	17747, 17755	N	K	Blood purification, analgesic, expectorant, wound healing			1	1				1	1		
Verbenaceae	<i>Verbena litoralis</i> Kunth	18076, 18138	N	K	Fever, menstruation, cysts in ovaries, vaginal fluxes, influenza, tranquilizing, sweating, uterus				1			1		1		1
Verbenaceae	<i>Verbena litoralis</i> Kunth	18090, 18063	N	Q	Cramps, menstruation, malaria, epilepsy, fever, skin problems: 'granos'	1						1	1	1		1
Verbenaceae		18031 (VW)	-	Q	Uterus							1				
Violaceae	<i>Viola guatemalensis</i> W.Becker	18192	-	K	Stress, headache, nervous system, ulcers, wound healing, gastritis, blood purification, acidity of the throat			1		1			1	1		
Vitaceae	<i>Cissus sp.</i>	18360	-	Q	Skin problems - 'granos' due to sexual relations								1			
Vitaceae	<i>Cissus sp.</i>	18321	-	Q	Wound healing, itching skin, 'granos', lepra, snake bites								1			1
Vitaceae	<i>Vitis bourgaeana</i> Planch.	18053	-	Q	Infertile women							1				

Family	Species	Source	O	G	Uses	M	C	B	P	D	U	R	T	B	S	O
Vitaceae	<i>Vitis sp.</i>	L	-	K	Balance hormones			1								
Vitaceae	<i>Vitis sp.</i>	L	-	K	Eye problems											1
Vitaceae	<i>Vitis sp.</i>	L	-	K	Fever											1
Vitaceae	<i>Vitis tiliifolia</i> Humb. & Bonpl. ex Schult.	18329	N	Q	Prostate							1				
Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	17788 (VW)	I	K	Gastritis, ulcers, infections, inflammations, burnings, wound healing, fractures, vaginal fluxes	1				1		1	1			1
Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	17788	I	K	Desinflamant, wound healing, blood purification, parasites, ulcers, refreshing			1		1			1			1
Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	17788 (VW)	I	K	Nerves, gastritis, ulcers, tumors, cysts, cancer, colon, uterus, prostate, ovaries, constipation, urine or faeces with blood					1	1	1	1	1		
Xanthorrhoeaceae	<i>Aloe vera</i> (L.) Burm.f.	17788 (VW)	I	Q	External tumors								1			
Zamiaceae	<i>Zamia loddigesii</i> Miq.	18055	-	Q	Gastritis, purgative					1						
Zamiaceae	<i>Zamia muricata</i> Willd.	18013	-	Q	AIDS, cancer, itching			1					1			
Zingiberaceae	<i>Curcuma longa</i> L.	17764	I	K	Digestive, stimulant, wound healing			1		1			1			
Zingiberaceae	<i>Renealmia alpinia</i> (Rotboell) Maas	17844	-	Q	Lesions due to hits	1										
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	L	I	K	Cancer, wound healing								1			
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	L	I	K												
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	L	I	K	Nerves, cancer, infections, cysts, tumors, ulcers, hernias, stroke					1			1	1		
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	L	I	Q	Se cuesta respirar'											1
Zingiberaceae	<i>Zingiber officinale</i> Roscoe	L	I	Q	Hiccup, stomach cramps					1						1

