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1 Original Research Article 1 2 ETHNOBOTANICAL SURVEY OF MEDICINAL PLANTS USED FOR TREATMENT OF 3 VARIOUS AILMENTS IN KANO METROPOLIS, NIGERIA 4 ABSTRACT 5 AIM : The aim of this research is to conduct an Ethno botanical survey of medicinal plants used in the 6 treatment of various ailments in Kano metropolis. 7 METHODOLOGY : A systematic survey of medicinal plants used in the treatment of different diseases in 8 Kano metropolis involving 66 participant (30 herbalists, 18 old people with knowledge of traditional 9 medicine, 6 Botanist and 12 tradition medicine users) was conducted from February 2016 to August 2016 10 using simple structured questionnaire.

11 RESULTS : The result revealed that 79 different plant species belonging to 48 plant families used for 12 curing various ailments in Kano metropolis. The most mentioned plant family used as medicinal plant in 13 Kano Metropolis according to this study includes Fabaceae, Moraceae, Combrataceae, Rubiceae and 14 Anacardiaceae.

The ailments mostly mentioned in the application of these medicinal plants/preparations 15 included; pile, typhoid fever, pains, cancers, cough/colds, rheumatism, diabetes and sexual dysfunction. 16 The plant habit and habitat of collection showed that 52% of the medicinal plant species are trees and 17 mostly found in the wild (62%).

The survey also revealed that the leaves were the major parts used for 18 herbal preparation accounted for 45%. The main methods of preparation are mostly decoction, then 19 infusion and pounding. 20 CONCLUSION : Plants continue to provide a source of hope for novel drug compounds as it have made 21 large contributions to human health and well-being.

22 Keywords: Ethno botanical survey, medicinal plants, Kano, Ailment 23 1. INTRODUCTION 24 Since ancient times, plants have been indispensable sources of both preventive and curative traditional 25 medicine preparations for human beings and livestock.

Historical accounts of traditional medicine depict 26 2 that different plants were used as early as 5000 - 4000 BC in China and 1600 BC by Syrians, 27 Babylonians, Hebrews and Egyptians [1]. Considerable indigenous knowledge system, from the earliest 28 times, is linked to the use of traditional medicine in different countries [2].

According to the World Health 29 Organization (WHO) approximately 80% of the world's population relies on traditional medicine to fulfill 30 their daily health needs [3]. Sofowora [4] reported that about 60-85% of the population in every country of 31 the developing world has to rely on traditional medicine. The practice of traditional medicine is 32 widespread in China, India, Japan, Pakistan, Sri Lanka and Thailand.

In china, about 40% of the total 33 medicinal consumption is attributed to traditional tribal medicines [5]. 34 In Nigeria, traditional medicine is well acknowledged and established as a viable profession [6], 35 and almost all plants seem to have some kind of application in traditional medicine [7].

Searches for 36 substances with antimicrobial activity in plants are frequent, due to their popular use as remedies for 37 many infectious diseases [8]. Plants are rich in different types of secondary metabolites, such as tannins, 38 terpenoids, alkaloids, and flavonoids, which have been found in vitro to have antimicrobial properties 39 [9][10].

40 Consequently, the development of drug resistance in human pathogens against commonly used 41 antibiotics has necessitated a search for new antimicrobial substances from other sources including 42 plants [11]. Today, it is estimated that plant materials are present in or have provided the models 43 relatively for 50% Western drugs [12].

Traditional medical practitioners in Nigeria use herbal preparations 44 to treat microbial infections such as typhoid and para-typhoid infections and they claimed that the primary 45 benefit of using plant derived medicines is that they are relatively safer than synthetic alternatives, 46 offering profound therapeutic benefits and more affordable treatments.

47 Several workers have conducted ethnobotanical surveys among various tribes of the

African 48 continent and some other parts of the world [13] in search of plants with antibacterial, antiviral and 49 antifungal properties. The medicinal values of these plants lie in some chemical substances they contain 50 that produce a definite physiological action on the human body [11].

Ethno botanical surveys are 51 important in order to understand the social-cultural and economic factors influencing ideas and actions 52 concerning health and illness and to get information on type of diseases and health problems prevalent 53 among the people of a particular locality. Such studies, as suggested by Lawal et al . [14], may help to 54 3 provide the basic health care services needed to improve health challenges of the rural population.

The 55 potentials of the plants are far from being tapped. This study is intended to document such valuable 56 information. The aim of this survey is to document some herbal medicines used in the treatment of 57 various ailment in Kano metropolis. 58 2. MATERIALS AND METHODS 59 2.1 Study Area 60 Kano State is a state located in North-Western Nigeria and the largest State of the Nigerian Federation, 61 Created on May 27, 1967 from part of the Northern Region.

Kano state is bordered by Katsina state to the 62 North-West, Jigawa state to the north-east, Bauchi state to the south-east and Kaduna state to the south- 63 west. Kano is located on 12° N and 8°30'E. It has a total area of 20,131 km 2. The urban area covers 64 137km2 and comprises of six LGAs - Kano municipal, Fagge, Dala, Gwale, Tarauni and Nassarawa with 65 population of 2,163,25 as at 2006 (NPC, 2006). Climate of the study areas have been described as 'AW' 66 type as identified by Koppen's climatic classification [15].

The vegetation is a Savanna type simply 67 described as closed grass or other predominantly herbaceous vegetation with scattered or widely spaced 68 woody plants. Vegetation types in the state are the northern Guinea savanna and Sudan savanna. 69 Northern Guinea Savanna is open woodland with grasses shorter than in the southern guinea where 70 grasses are 1.5 to 3m tall.

The Sudan Savanna has scattered trees in open grassland with grasses under 71 1.2m tall. The vegetation has been largely cleared for cultivation to form cultivated parkland. Parkland has 72 scattered protected trees at some distance apart in open cultivated land [16]. 73 74 75 2.2

Population and Sampling Procedure 76 The study is a survey research in which a total of 66 participants (30 herbalists, 18 old people with 77 knowledge of traditional medicine,

6 Botanist and 12 tradition medicine users) in six local governments 78 (Kano municipal, Fagge, Dala, Gwale, Tarauni and Nassarawa) that makes up the metropolitan Kano 79 were used.

Using the purposive technique, 5 herbalists, 3 old people, 1 botanist and 2 traditional 80 medicine user were selected from each Local Government as respondents. The herbalists were identified 81 during drug sales in some markets in the study area. 82 4 Table 1: Herbal selling points from the study area and number of respondents 83 Local Government Herbal Selling Point Herbalist Botanist Aged people Herb users Kano Municipal Kurmi Market 5 1 3 2 Fagge Fagge Social Welfare 5 1 3 2 Tarauni Tarauni Central Market 5 1 3 2 Dala Kukar idaw, Gwammaja 5 1 3 2 Gwale Mandawari 5 1 3 2 Nassarawa Gama Market 5 1 3 2 Total 30 6 18 12 84 2.3

Data Collection Procedure 85 The survey was conducted from February 2016 to August 2016 covering 6 six local governments (Kano 86 municipal, Fagge, Dala, Gwale, Tarauni and Nassarawa) that makes up Kano metropolis. A semi- 87 structured questionnaire is used for data collection. Enquired items include; Indigenous name of herbal 88 medicinal, plants medicinal use, part of plant used, location from where plants were collected, and 89 method of preparation of the herbal medicine. 90 2.4

Data Analysis 91 A checklist of all recorded species of medicinal value was compiled, including their indigenous, common 92 and scientific names, plant origination (wild or cultivated), medicinal uses and location found. Data was 93 also presented in terms of the methods of preparation and administration to patients All the lists 94 generated by the different key informants were presented inform of a table. 95 5 96 97 Plate 1: Some traditional drugs selling points in Kano Metropolis 98 3.

RESULTS 99 The survey of medicinal plants used in the treatment of various ailments in Kano metropolis is presented 100 in Table 2. Total of 79 species belonging to 48 different families were reported. 101 Table 2: Botanical, common, local, family and sources of the medicinal plants used in Kano 102 metropolis 103 Botanical name Common name Local name Family name Source Acacia nilotica Gum Arabic Bagaruwa Fabaceae Wild Acacia sebriana Paper back acasia Farar kaya Fabaceae Wild Acacia senegalenis Gum acacia Dakwara Fabaceae Wild Adansonia digitata Baobab Kuka Malvaceae Wild Allium cepa Onion Albasa Amaryllidaceae Cultivated 6 Alium sativa Gallic Tafarnuwa Amaryllidaceae Cultivated Anacardium occidentale Cashew Kashu Anacardiaceae Cultivated Ananas comosus Pineapple Abarba Bromeliaceae Cultivated Annona senegalensis Custard apple Gwandar daji Annonaceae Wild Anogeisus leocarpus Axle wood tree Marke Combrataceae Wild Artemesia annua Sweet annie Tagargade Arteraceae Cultivated Azadirachta indica Neem Dogonyaro Meliaceae

Wild/cultivated Balanites aegyptica Desert date Aduwa Balanitaceae Wild Boerhavia diffusa Spreading hog weed Gadon maciji Nyetaginaceae Wild Boswellia dalzielii Frankincense tree Hararrabi Burseraceae Wild Calotropis procera Sodom apple Tumfafiya Asclepidaceae Wild Carica papaya Pawpaw Gwanda Caricaceae Cultivated Cassia albida Cassia tree Gawo Fabaceae Wild Cassia fistula Golden rain tree Fulasko Fabaceae Wild Cassia siamea Kassod tree Dorawar turawa Ceasalphinoideae Wild Catunaregam nilotica - Kwanarya Rubiaceae Wild Ceiba pentendra Silk cotton Rimi Malvaceae Wild Citrallus lanatus Water melon Kankana Curcubitaceae Cultivated Citrus aurantifolia Lime Lemon tsami Rutaceae Cultivated Commiphora africana Corkword Dashi Burseraceae Wild Crinum jagus Harmattan lily Gadeli Amaryllidaceae Wild Cymbopogan citratus Lemon grass Ciyawar lemon Poaceae Cultivated Cyperus articulate Jointed flat sedge Kajiji Cyperaceae Wild Detarium microcarpum Tallow tree Taura Fabaceae Wild Diospyros mispiliformis African ebony Kanya Ebenaceae Wild Dodonea viscosa Hop bush Fil fil Sapindaceae Wild/ Cultivat Erythrina senegalesis Senegal coral tree Minjirya Papilionoidea Wild Eucalyptus camadulensis River red gum Turare Myrtaceae Wild/ Cultivat.

7 Fiscus congensis - Baure Moraceae Wild Fiscus iteophylla - Shirinya Moraceae Wild Fiscus platyphylla Flake rubber tree Gamji Moraceae Wild Fiscus thoningii Strangler fig Chediya Moraceae Wild Garcinia kola Bitter kola Namijin goro Clusiaceae Cultivated Gardenia aqualla - Gaude Rubiaceae Wild Gossypium hirsitum Cotton plant Auduga Malvacea Cultivated Guiera senegalensis Guiera Sabara Combrateceae Wild Gynandropsis gynandra Cat's whiskers Gasaya Cleomaceae Wild Hibiscus sabradifa Roselle Zobo Malvaceae Cultivated Hyphaena thebaica Doum palm Goruba Aracaceae Wild Jatropha curcas Physics nut Binidazugu Euphorbiaceae Wild Khaya senegalensis Mahogany Madaci Meliaceae Wild/ Cultivat.

Leptadenia hastata Tears Yadiya Apocynaceae Wild Lowsonia inermis Henna plant Lalle Lythraceae Wild Mangifera indica Mango tree Mangwaro Anacadiaceae Cultivated Menta piperita Pepper mint Na'a na'a Lamiaceae Cultivated Mitracarpus hiartus Girdle pod Goga masu Rubiaceae Wild Momardica balsamina Balsam apple Garahuni Curcubitaceae Wild Moringa oleifera Moringa Zogale Moringaceae Cultivated Nauclea diderrichii Box wood Tafashiya Rubiaceae Wild Nigella satila Black cumin Bakin algarif Ranunculaceae Cultivated Ocimum gratissimum Tea bush Doddoya Laminaceae Cultivated Olea eupopeen Olive tree Zaitun Oleaceae Cultivated Parkia biglobosa African locust bean Dorawa Fabaceae Wild Piliotigma thonningii Monkey bread Kalgo Caesalphinoideae Wild Pistia stratiotes Water cabbage Kainuwa Araceae Wild Piper negrum Black pepper masoro Piperaceae Cultivated 8 Plumeria rubra Temple tree Apocynaceae Wild Psidium guajava Guava Goba Myrtaceae Cultivated Proposis africana Iron tree Kirya Fabaceae Wild Sclerecarya birrea Marula Danya Anacardiaceae Wild

Securidaca longependulata Violet tree Sanya Polygalaceae Wild Sienna obtusifolia Sickle pod Tafasa Fabaceae Wild/cultivat Senna occidentalis Negro coffee Rai dore Ceasalphinoideae Wild/ Cultivat.

Senna singuena Wild cassia Runhu Fabaceae Wild Sorghum bicolor Guinea corn Dawa Poaceae Cultivated Strychnos spinosa Monkey orange Kokiya Loganiaceae Wild Syzygium aromaticum Clove kanumfari Myrtaceae Cultivated Terminalia avicennioides Black limba Baushe Combrataceae Wild Vernonia amygdalina Bitter leaf Shuwaka Asteraceae Cultivated Vitex doniana Black plum Dinya Verbaceae Wild Ximenia americana Wild olive Tsada Olacaceae Wild Zingiber officinale Ginger Citta Zingebaraceae Cultivated Zizizpus mauritiana Indian plum Magarya Rhamnaceae Wild Zizipus mucoronata Buffalo thorn Magaryar kura Rhamnaceae Wild 104 Table 3: The medicinal purposes, method of preparation and plant parts used for medicinal purpose is 105 presented in Table 3. Leaves are the most common part used for medicinal purpose according the study.

106 Table 3: Medicinal purpose, method of preparation, habit and plant parts used for medicinal 107 purpose 108 Botanical name Habit Part used Medicinal purpose Method of preparation Acacia nilotica Tree Fruit File Decoction Acacia sebriana Tree Leaves/stem bark Pain reliever and wound healing Pounded and crushed Acacia senegalenis Tree Stem bark Soothes cough and sore throats Pounded and crushed Adansonia digitata Tree Leaves Cancer, inflammation, cardiovascular diseases Powder leaf eaten as soup 9 Alium cepa Herb Bulb Cancer, lower cholesterol and improve immunity Bulb taken in food as condiment Alium sativa Herb Bulb Cold Bulb taken in food or orally Anacardium occidentale Tree Leaves/stem bark Diarrhea and thrush Decoction Ananas comosus Shrub Fruit Laxative Taken orally Annona senegalensis Shrub Leaves/stem bark Cancer and pile Decoction Anogeisus leocarpus Tree Stem bark Pile and cough Soak in water/infusion Artemesia annua Herb Leaves Yellow fever and vomiting Infusion Azadirachta indica Tree Leaves/stem bark Typhoid, malaria and yellow fever Pounded and taken orally Balanites aegyptica Tree Fruits/leaves Intestinal worm, leucoderma and psychiatric disorder Decoction Boerhavia diffusa Herb Leaves/root Stomach ache and pain reliever Infusion Boswellia dalzielii Tree Stem bark Pile and body heat Decoction Calotropis procera Shrub Leaves Cancer Pounded and apply to infected area Carica papaya Tree Leaves Antimicrobial and Gastrointestinal disorder Decoction Cassia albida Tree Stem bark Body pain Decoction Cassia fistula Tree Leaves Diarrhea, antimicrobial agent Decoction Cassia siameae Tree Leaves Rheumatism Decoction Catunaregam nilotica Tree Root Snake bite, Genital disorder Applied powdered root Ceiba pentendra Tree Leaves Gastrointestinal disorder Infusion Citrallus lanatus Herb Fruit Laxative Fruit taken orally Citrus aurantifolia Shrub Leaves/fruit Cold and body rashes Taken orally Commiphora Africana Shrub Leaves Malaria and ulcer Decoction Crinum jagus Herb

Bulb Anti-oxidant, diabetes Bulb taken orally Cymbopogan citrates Herb Leaves Malaria, convulsion and anti bacterial Decoction Cyperus articulate Herb Root Cold Decoction with potash 10 Detarium microcarpum Tree Fruit Pile, tuberculosis, meningitis and diarrhea Decoction or taken orally Diospyros mispiliformis Tree Leaves Pile Decoction Dodonea viscose Shrub Leaves Typhoid fever Decoction Erythrina senegalesis Tree Leaves/stem bark Dysentery Infusion or taken in pap Eucalyptus camadulensis Tree Leaves Fever, cold and stomach upset Infusion Fiscus congensis Tree Root Arthritis Apply to infected part Fiscus iteophylla Tree Leaves Blood clotting Apply powder to infected part Fiscus platyphylla Tree Leaves/stem bark Malaria and convulsion Infusion or decoction Fiscus thoningii Tree Stem bark Yellow fever, UTI and diarrhea Taken orally in beverages or pap Gardenia aqualla Shrub Leaves/root Sedative, laxative, diabetes and liver diseases Decoction Gossypium hirsitum Herb Leaves Skin problems Decoction Guiera senegalensis Shrub Leaves, root Pile, body heat Decoction Gynandropsis gynandra Herb Leaves Anemia and blood loss Eaten as vegetable Hibiscus sabradifa Herb Flower Blood tonic and hypertension Boil in water and taken as beverage Hyphaena thebaica Tree Fruit Pile and stomach upset Decoction or eaten orally Jatropha curcas Herb Whole plant Body pain Decoction Khaya senegalensis Tree Leaves/stem bark Pain, inflammation and diarrhea Decoction Leptadenia hastate Herb Root Yellow fever Decoction Lowsonia inermis Shrub Root Cancer and anti inflammatory Boil powdered root Mangifera indica Tree Leaves/stem bark Malaria, typhoid, jaundice in children Decoction Menthe piperita Herb Leaves Anti cancer, oxidant and anti plasmodic Decoction 11 Mitracarpus hiartus Herb Whole plant Eczema Applied to infected part Momardica balsamina Herb Whole plant Fertility in women Decoction Moringa oleifera Tree Leaves Blood tonic Cooked and taken as food Nauclea diderrichii Tree Stem bark Ulcer Decoction Nigella satila Herb Seeds Diabetes and cancer Eating in food as condiment Ocimum gratissimum Herb Leaves Antibiotics, diabetes, pain killer Decoction Olea eupopeen Shrub Leaves/seeds Heart and kidney diseases, arthritis Decoction Parkia biglobosa Tree Fruits Dysentery Taken orally Piliotigma thonningii Shrub Leaves/root Pile Infusion with red potash Pistia stratiotes Herb Whole plant Mental illness Burning in charcoal fire Piper negrum Herb Seeds Constipation and anti inflammatory agent Grounded and use as spices Plumeria rubra Tree Leaves/flower Fever, dysentery and pertusis Infusion Psidium guajava Shrub Leaves/stem bark Dysentery and gastrointestinal disorder Decoction Proposis Africana Tree Stem bark Pile and fire burn Decoction or applied to infected part Sclerecarya birrea Tree Leaves/stem bark Antibacterial Decoction Securidaca longependulata Tree Leaves/stem/root Burn Applied to infected part Sienna obtusifolia Herb Stem bark/seed Eye disorder and conjunctivitis Pounded Senna occidentalis Herb Leaves Malaria, Fever Decoction Senna singuena Herb Leaves Malaria, fever and wound infection Decoction/infusion Sorghum bicolor Grass Leaves Immune modulator Decoction Strychnos spinosa Tree Leaves/root and fruit Snake bite, purgative, analgesic Decoction Syzygium aromaticum Herb Seeds Cough

and catarrh Decoction/ used in food as spices Terminalia avicennioides Tree Leaves Pain killer, diarrhea, dysentery and wound Decoction 12 Vernonia amygdalina Herb Leaves Fever, typhoid fever Cooked and eaten as soup Vitex doniana Tree Leaves/stem bark Gastrointestinal disorder Infusion/decoction Ximenia Americana Tree Leaves/ stem/root Fever, cold, dysentery, used as laxative Decoction Zingiber officinale Stem Rhizomes Cold and catarrh Decoction/ used in food as spices Zizizpus mauritiana Tree Leaves/root Malaria, stomach upset, spiritual problems Decoction Zizipus mucoronata Tree Stem bark/root Pain killer, respiratory ailment Pounded/decoction 109 4.

DISCUSSIONS 110 The revival of interest in the use and importance of African medicinal plants by many developing 111 countries has led to intensified efforts on the documentation of ethno medicinal data of medicinal plants, 112 since most traditional healers keep scanty records and their information is passed on, mainly verbally, 113 from generation to generation [17].

Although traditional medicines are highly recognized and commonly 114 used both in the rural and urban communities in Nigeria, the accurate knowledge of these plants and their 115 medicinal properties are known mostly by traditional medicine sellers and only by few individuals in the 116 community especially aged people, Botanist and medicinal plant users . Plants are more easily 117 recognized by their local names in every part of the world.

These local names play a vital role in ethno 118 botanical study of a specific tribe or region [18]. In the present study, respondents interviewed gave local 119 names of plants in recipes for treating particular disease(s). Local names provide means of reference by 120 local people in a particular area.

Information gathered showed that increasing number of people is turning 121 to herbal remedies for prevention and cure of various diseases. 122 In this study, Seventy-nine (79) plants from 48 different families were recorded as medicinal 123 plants used in treatment of various illness within Kano metropolis. The most mentioned family include; 124 Fabaceae (10 members), Moraceae (5 members), Combrataceae, Rubiceae and Anacardiaceae (4 125 members each), Amaryllidaceae, Myrtaceae and Ceasalphinoidea (3 members each). All plant forms 126 such as trees, shrubs and herbs represented the medicinal plant species mentioned in this study.

Trees 127 were found to be the most used plants accounted for 52 % followed by herbs 33 % while shrubs 128 13 accounted for 15 %. Some of the plants revealed in the survey have been cited in the ethno botanical 129 survey of some African countries [19]. The continuous search for natural plant products for use as 130 medicines is encouraged by

ethno botanical survey; Igoli et al .

[20] recognized ethno botanical survey as 131 one of the major approaches for selecting plants for pharmacological screening. 132 133 The plant parts mostly used in this study are the leaves with 36 entries followed by stem bark and 134 roots with 21 and 12 entries respectively. The use of whole plant has 4 entries; fruits had 6 entries while 135 seeds and flower had 3 and 1 entries each.

Therefore, the plant leaves are important ingredient in 136 traditional treatment of various ailments in Kano Metropolis as it is the component that featured most in 137 many herbal preparations which were in agreement with Adekunle [21] and Abdulsalami [22]. The result 138 of this study revealed that decoction is the most frequent method of preparing medicinal plants, which 139 accounted for over 52% of the methods used.

This is followed by infusion and pounding which accounted 140 for 15% and 8% respectively. On the hand, the ailments mostly mentioned in the application of these 141 medicinal plants/preparations included; pile, Malaria, typhoid fever, pains, cancers, cough/colds, 142 rheumatism, diabetes and sexual dysfunction. 143 Most of the plants sourced from the wild with the exception of few.

Out of the 79 plants recorded 144 in this study, 49 plants are sourced from the wild accounted for 62%, 24 sourced from gardens and farms 145 i.e. cultivated (30%) while 6 sourced from both wild and gardens (8%). This result is inconformity with the 146 study of Muhammad et al. [16](2015) who found that 72% of the medicinal plants used in Kano metropolis 147 are sourced from wild. In a study conducted on medicinal plants by Mesfin et al.

[23], it found out that 148 58% of all medicinal species in the study area in Ethiopia are sourced from the wild while only 6.4% are 149 cultivated. 150 5. CONCLUSION 151 The present study has established a data bank for some medicinal plants that are used in the 152 management of various ailments in Kano Metropolis. The results of the study revealed that there is high 153 diversity of medicinal plants and traditional knowledge about the use, preparation, and application, which 154 is still maintained among local people of metropolitan Kano.

It has found that 79 Species of plants 155 covering 48 families are available as medicinal plants used in Kano metropolis. The most mentioned plant 156 14 family used as medicinal plant in Kano Metropolis according to this study includes Fabaceae, Moraceae, 157 Combrataceae, Rubiceae and Anacardiaceae.

The ailments mostly mentioned in the application of these 158 medicinal plants/preparations included; pile, typhoid fever, pains, cancers, cough/colds, rheumatism, 159 diabetes and sexual dysfunction. From this survey it is now known that the plant parts mostly used for 160 herbal preparations found in Kano Metropolis are the leaves, stem bark, and roots in that order followed 161 by whole plants and fruits and least seeds and flower.

Therefore, based on the present study, Plants 162 continue to provide a source of hope for novel drug compounds as it have made large contributions to 163 human health and well-being. It is recommended that further research on the screening of the secondary 164 metabolites of these medicinal plants for biological and pharmacological studies will be necessary as well 165 as the isolation of active compounds and their structural elucidation for the maximal use of the medicinal 166 plants.

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