IOSR Journal of Biotechnology and Biochemistry (IOSR-JBB)
ISSN: 2455-264X, Volume 11, Issue 2 Series 1 (Mar. – Apr. 2025), PP 01-17
www.iosrjournals.org

An Ethnoveterinary Survey Of Invasive Alien Medicinal Plants Used In The Treatment Of Respiratory Infections On Animals In Sekhukhune District, Limpopo, South Africa.

Dr Jacobus Kori Madisha
Limpopo Education,84 Limpopo Street, Modimolle, South Africa
P.O Box 1777, Marble Hall 0450, South Africa

Abstract
Invasive alien plant species are used individually or in combinations to treat respiratory infections. However, ethnoveterinary information of invasive alien species is insufficient, especially on the treatment and management of respiratory infections in animals. An ethnoveterinary survey was conducted in the Sekhukhune District using a semi-structured questionnaire, 5 livestock owners and 30 were traditional health practitioners were interviewed. Importance of medicinal plants was analysed using Fidelity Level (FL), Informant Consensus Factor (ICF), and the Use Value (UV). Twenty invasive alien species belonging to fourteen families were documented for the treatment of seven respiratory infections. Further pharmacological studies are encouraged on the species with the highest FL, ICF and UV values.

Keywords: *Respiratory Infections, Invasive alien plants, Ethno veterinary practice, Animal aliments, Indigenous knowledge.*

Date of Submission: 06-04-2025 Date of Acceptance: 16-04-2025

I. Background

Plants have been cures in traditional medicine for numerous thousand years [1]. From the time immemorial, human civilizations have been exploring and using various plants and plant products to cure the lethal diseases. Different plants species and their uses as medicine are greatly well-known to indigenous communities in different parts of the world. Local people are specialist for mounting inventive practices and products from their surrounding environment particularly, the plant world [2,3]. Many drugs have plant origin, and several plants are currently undergoing investigation to ascertain their therapeutic efficacies [4,5].

Plants produce a diverse array of secondary metabolites with many functions, such as defence against herbivores, diseases and parasites [6,9].There are exciting possibilities for using plants as a source for the discovery of novel lead structures to be used in drug production, and also for the development of active plant extracts useful in treating a variety of ailments in humans and animals [8].There are considerable economic benefits in the development of indigenous medicines and in the use of medicinal plants for the treatment of various diseases [7].

South Africa is habitat to a rich clement flora, possessing something like 24 000 species comprising more than 10% of the world's vascular plant flora [10] .In South Africa, as in many other developing countries, the rich cultural variety is reflected in the use of plants as medicines, and it has been estimated that up to 60% of South Africans consult traditional healers, usually in addition to making use of orthodox medical services[16].In the case of animal diseases, it appears that the owners of the livestock will generally treat their own animals using medicinal plant information that they themselves possess, rather than consulting traditional healers [8]. Ethnoveterinary medicine (EVM) comprises a multifaceted classification of philosophy, skills, information and practices unfolding to animal farming and general animal care [17].The practice of EVM includes the utilize of analytical measures, animal farming practices, surgical methods and customary veterinary theory in addition to the use of ethnoveterinary plants to prevent and control disease [28,22].

It is therefore significant to keep in mind that lack of activity in a laboratory-based *in vitro* screening system does not involuntarily keep in touch to be deficient in of effectiveness of a traditional medication .Many aspects of EVM need to be taken into description, for example methods of preparation and administration of the remedy, as well as management practices to limit the impact of the disease [27].Orthodox are very expensive with costly treatments so an option such as herbal medication in practiced is necessary especially that in developing countries with very few if any professional veterinary .

Ethno-veterinary studies showed that herbal drug is an alternative remedy for treatment and management of respiratory disorder in both animals and human [19]. Many traditions have taboo and cultural restrictions on the harvesting of plants especially those use for respiratory disease can only be harvested in winter to protect them from been use for other purposes. Diseases of livestock potentially have severe economic impacts in terms of production losses following mortality and morbidity, particularly in the case of cultures where animals are equated to wealth [8].

Invasive alien plant species are plant species that establish themselves outside their native distributional range. The detrimental ecological effects of alien plant species on natural ecosystems, economy and human health are well documented with Shackleton and Shackleton [23] arguing that there is need to evaluate the positive and negative impacts of alien plant species on biodiversity, humankind and economy. Considerate of the use of alien plant species by rural communities in rural and marginalized areas, and factoring these aspects into cost-benefit models is complex, as this is dependent on a wide range of factors, including abundance, time since invasion, local-level costs and benefits [24].

The impacts of alien plant species can generally be reliably evaluated through an assessment of local knowledge and the social benefits associated with alien plant species, as it is often people that influence plant distribution and the need for managing invasions by alien plant species to minimize the ecological, economic and cultural impacts associated with these species [25,26].

Respiratory diseases can be caused by several reasons, either by the presence of microorganisms or toxins in the surroundings which generally attack organisms with weak or immunologically predisposed to suffer any these discomforts. The most common are the respiratory flu, tonsillitis, bronchitis, pneumonia, influenza and most recently corona which have the world recent pandemic . The main symptoms of these disorders are often very similar in all mammals and are manifested in the following ways: Flushing, Cough, Fever, and Headache, throat, ears, or muscle aches and Tiredness.

Respiratory tract infections continue to be a major health challenge worldwide especially due to the increasingly fast development of resistance to the drugs currently in use. Diseases of livestock potentially have severe economic impacts in terms of production losses following mortality and morbidity, particularly in the case of cultures where animals are equated to wealth. Such diseases also impact on the health and well-being of companion animals. The search for effective and affordable remedies to combat diseases in animals, as is the case in human medicine, is ongoing[8]. The ethnobotanical literature on medicinal usage of invasive alien plants for various ailments in Vhembe, Waterberg, Eastern cape, Limpopo were mentioned in literature [11–15], but no systematic ethnoveterinary study has specifically focused on respiratory problems in the ethnic areas of Sekhukhune, Limpopo South Africa. Many invasive alien plant species are traditionally used for respiratory illness treatment, and some have been investigated for their efficacy with positive results. The purpose of this study is to document and scrutinize the diversity of therapeutic alien plants used for treating the respiratory problems in Sekhukhune, Limpopo South Africa. This research will facilitate future scientific authentication through antimicrobial, pharmacological and phytochemical studies**.**

II. Methods

Description of study area

The study was conducted in five local municipalities Elias Motswaledi, Ephraim Mogale ,Tubatse, Fetakgomo,. and Makhuduthamaga. of the Sekhukhune District, Limpopo Province, South Africa. Geographically Sekhukhune District lies between 24°50′S and 29°50′E (Fig. 1). The district is located in the south east part of Limpopo Province, and covers an area of 13,528 km^2, making it the largest district in the province. A large portion of the district is identified as rural areas. Semenya et al. (2012) [13] noted that the high floristic diversity of the area coupled with high unemployment rate resulted in a heavy reliance of natural resources such as plants to meet livelihood needs. The vegetation of the district was classified by as aris-semi savannas .It is characterized by a mixture of trees, shrubs and grasses. This type of vegetation has provided a diverse flora with rich medicinal plants that the people of the study areas have always used to treat many illnesses. The ethnic group use herbal medication either alone or in combination with orthodox medicines for the treatment of several infections [36,37].

Figure 1 South Africa

Figure 2 Sekhukhune District Municipality

The Study area population

The study was conducted in the Sekhukhune district (Fig. 2), in Elias Motswaledi, Ephraim Mogale , Tubatse, Fetakgomo, and Makhuduthamaga in Limpopo province in South Africa. The surveyed district is inhabited by Black African 98.6%, Coloured 0.1%,Indian/Asian 0.2%,White 1.0% .Black people Northern Sotho 82.2%,Southern Ndebele 4.4%,Zulu 3.3%,Tsonga 2.0%, Other 8.1% mostly from Bapedi ethnic group, as well as few Ndebele. The Bapedi ethnic group constitutes the largest cultural group in the Limpopo Province(South Africa),comprising 57% of the total provincial population(Limpopo Provincial Government,2012)The study was ,however, restricted to the area around Sekhukhune in order to ensure that healer interviewed, livestock owners, elderly were Sepedi speaking and use mountain, bush and river as their closest source of medicinal plants.

Ethnoveterinary survey

To investigate the use of invasive alien plant species for the treatment of respiratory infections in animals, previous ethnobotanical surveys reporting medicinal uses of alien species were selected from South Africa[5,11–15,18,20] The latest revised legislation of invasive alien plants species regulation, gazetted on 1 August 2014 was consulted for confirmation of plant species listed invasive species (National Environmental Management Biodiversity Act (Act No. 10 of 2014))[21].At least 60 declared invasive plant species were identified. Declared invasive plant species were investigated for the treatment of respiratory infections in animals. Pictures were shown to traditional health practitioners and participants to make sure that they could correctly identify the plants.

Ethical compliance

The present study was carefully designed with strict compliance of bio-ethics and approved by the ethics Committee of University Pretoria, South Africa under the approval No REC029-19. Prior to data collection, a brief group discussion was held with the participants for agreement, to tell the objectives of research and to guarantee the safety of indigenous knowledge. These practices clear the aim of research and develop confidence in participants so they give reliable knowledge without any hesitation. Initially, 50 participants were selected of them were but among them, 5 were hesitant in providing knowledge, and 10 could not be located during the data collection due to personal commitment, leaving a total of 35(male 29 and females 21) participants for data collection. This 5 traditional healers were prepared to identify no more than five medicinal plants and their uses. These healers informed the researcher that they were unwilling to divulge information about certain medicinal plants, the properties of which they considered to be very powerful. They clearly wished to keep this knowledge to themselves as something belonging to their own private domain.

The ability to use plants of such purported potency apparently serves as these healers' speciality trade marks in their communities, conferring upon them the status of being the best among their peers. All plants in this survey are alien listed by the biodiversity action plan for control. The native communities of the area have knowledge about the use of these plants and but not the dangers the can cause to the ecology of their area.

Field survey and data collection

This survey focused on the use of traditional plant resources with specific reference to the treatment of respiratory infections on animals. Fieldwork was performed between 01 April 2021 to 30 June 2021. Collectively, 35 participants were interviewed after receiving their prior informed consent. Data was collected from native indigenous health practitioners and local participants (female and males of different ages, experiences and education levels). During field surveys, face to face interviews and semi-structured interviews were also conducted. The questionnaire was explained in Sepedi, the local language. The questionnaire was divided into sections that relate to various aspects of respiratory infections in animals such as local names, medicinal plants use, collection sites, growth forms, plants part used, preparation methods, dosage, combinational uses and toxicity of reported plants. Documentation of data while field survey was evaluated and organized by usage of quantitative and qualitative analysis. In addition, data was compared with previously published research articles on alien plants uses with higher medicinal values for various infections.

Identification of alien plants

In the current survey, alien healing plants documented by participants was identified by their pictures from SANB and National Environmental Management Biodiversity Act listed alien species as it was more difficult to use common name as some if no many have no common name and sometime physically pointing at plants . Lack of indigenous name also show that their originally not from Sekhukhune with some using only description name. The plant specimens were further authenticated by using literature, articles of alien plants and SANB list of alien species as the show pictures . In addition, some plants used by the local healers were photographed.

Table 1 Demographic Data of Participants

Parameters		Participants(N)	N(%)
Gender	Female	10	29
	Male	25	71
Age	36–46	3	8
	47–57	6	17
	58–68	7	20
	69–79	11	32
	80-90	6	17
	90-100	2	6
Education	No Formal Education	10	29
	Primary	13	37
	Secondary	7	20

	Tertiary	2	6
	Others	3	8
Collaboration with modern medicine	Collaboration	15	43
	Non Collaboration	20	57
Occupation	Herbalists	30	86
	Retirees	4	11
	Housewives	1	3
Residence	Urban	3	9
	Rural	32	91
Marital status	Single	13	37
	Married	15	44
	Widowed	6	17
	Divorced	1	2

Table 2 Alien Plants used for respiratory infection in Animals.

S. No.	Botanical Name, Local name and Reference	SANB No	Family	Part Used	LIFE FORM	SYMPTOMS TREATED	No of user	Use Value	Mode	Importance
1.	*Lantana camara*[107]	187	Verbenaceae	L	Shrub	Coughing/ Fever, flu	19	0,54	Oral	Veterinary Human
2.	*Agave sisalana* [104]	21	Agavaceae	R, W	Shrub	Coughing, Fever, flu	16	0,46	Oral	Veterinary Human
3	*Ageratum conyzoides* [119-122]	24	Asteraceae	L	Herb	Coughing, Fever, flu	16	0,46	Oral	Veterinary Human
4	*Tecoma stans*[105]	359	Bignoniaceae	L	Shrub	Coughing, Fever, flu	9	0,26	Oral	Veterinary Human
5	*Opuntia ficus-indica*[114] Motoro o mo Hwibidu	239	Cactaceae	L, R,	Shrub	Coughing, Fever, flu	10	0,29	Oral	Veterinary Human
6	*Psidium guajava*[112] Guva	294	Myretaceae	L	Tree	Coughing, flu	29	0,83	Oral/ Feed	Veterinary Human
7	*Canna indica*[99] Sekalebake	73	Cannaceae	R, L	Herb	Coughing, flu	26	0,74	Oral	Veterinary Human
8	*Ricinus communis* [15] Mokhura	304	Euphorbiaceae	L	Shrub	Coughing, flu	29	0,83	Oral	Veterinary
9	*Senna didymobotrya*[110,111] Morotwanaditshosi wa go ema	331	Fabaceae	L	Tree	Coughing, flu	33	0,94	Oral/ Feed	Veterinary
10	*Hypericum perforatum* [102,103]	176	Hypericaceae	L, B	Herb	Coughing, flu	11	0,31	Oral/	Veterinary Human
11	*Datura stramonium*[101] *Sekamokhura/* Kgookgoo	120	Solanaceae	R, L	Herb	Coughing, flu	28	0,80	Oral	Veterinary
12	*Cannabis sativa* [13] Motekwane		Cannabaceae	L,S	Herb	Coughing flu, Fever,TB, Pneumonia	35	1	Oral	Veterinary Human
13	*Cylindropuntia fulgida*	112	Cactaceae	L,W	Herb	Coughing, flu	3	0,08	Oral	Veterinary
14	*Caesalpinia decapetala* [123,96]	64	Fabaceae	L,W		Coughing flu,	18	0,51	Oral	Veterinary
15	*Jacaranda mimosifolia*[13,15] Jakaranda	184	Bignoniaceae	S	Tree	Fever, flu	4	0,11	Oral	Veterinary
16	*Schinus molle*[50,106] Thoba		Anacardiaceae	L,B	Tree	Coughing, flu	34	0,97	Fumugate/ Smoke	Veterinary Human
17	*Argemone ochroleuca* [95] Matjhakgatjha	44	Papaveraceae	L,S	Herb	Asthma, flu, Pneumonia,TB	24	0,71	Oral	Veterinary Human
18	*Tithonia diversifolia*[129]	163	Asteraceae	L	Shrub	Coughing, flu	17	0,49	Oral	Veterinary
19	*Eucalyptus camadulensis*[125,127] Mopilikomo	136	Myrtaceae	L	Tree	Coughing, flu,TB, Pneumonia	35	1	Oral/Feed	Veterinary Human
20	*Tithonia rotundifolia*[129]	164	Asteraceae	L	Shrub	Coughing, flu	17	0,49	Oral	Veterinary

Table 3 Families

Family	
Verbenaceae	1
Agavaceae	1
Asteraceae	3
Bignoniaceae	2
Cactaceae	2
Myretaceae	2
Cannaceae	1
Euphorbiaceae	1
Fabaceae	2
Hypericaceae	1
Solanaceae	1
Cannabaceae	1
Anacardiaceae	1
Papaveraceae	1
Total	14

III. Data Analysis

The collected datasets were captured in MS Excel 2013 and analysed using descriptive and inferential statistics. Different quantitative tools such as Frequency of citation (FC) and relative frequency of citation (RFC), Jaccard index (JI), Chi-square test, Family importance value (FIV), Fidelity Level (FL), Informant Consensus Factor (ICF) and Use Value (UV) were used to analyse the importance of medicinal plants and informants' knowledge about categories of respiratory infections.

Use value (UV)

Use value is calculated to assess all probable usage of plant species. UV of plants gives a quantitative analysis for plant citation. UV tells the relative importance of plant flora recognized locally. UV was analysed according to [32].

UV =u/N

Where u is the total participants stating various uses of a plant and N is whole number of participants. UV is usually (1) if the number of usages is greater, and (0) if the usage report for plants species is less. UV not deliver data on multiple or single usage of plant flora is considerably low. UV does not deliver any data on the single or multiple uses of plant species.

Frequency of citation (FC) and relative frequency of citation (RFC)

FC is used for evaluating the most preferred plants or more used plant species. RFC was analysed to intricate the knowledge of traditional flora about usage of therapeutic flora in the study site.

RFC = FC/N $(0 < RFC < 1)$

Where RFC is denoted by relative frequency citation, FC (Frequency of Citation) is the number of participants who stated the plant flora and N is whole number of informants[30].

Fidelity level (FL)

To analyse most preferred plant usage for the cure of a specific disease, we used (FL) index adopted by [31]. FFL indicates the importance of one species over other, to cure specific infections. Fidelity level shows the percentage of participants who reported the use of specific plant species for a particular infections (Animals Skin Infections).

FL (%)= NP/N x 100

Where, Np is the number of participants that declare the usage of species for definite infections, and N is total participants that use plants as a medicines for the treatment of any given infections [33]

Jaccard index (JI)

Jaccard index (JI) is evaluated by comparison of formerly published studies from local, regional and global level by analysing the percentage of cited plant species and medicinal usage, by using the following formula:

JI = c multiply 100/a + b−c

where “a” is the number of species of area A, “b” is number of species of area B, and “c” is number of species common in A and B [34].

Informant consensus factor (ICF)

The Informant Consensus Factor (ICF) value was calculated using the formula: ICF=(Nur-Nt)/(Nur-1), where Nur is the number of use report of informants for each skin infection (SI), and Nt is the number of taxa used for a specific respiratory infection (RI). [90]

Chi-square test

The knowledge of medicinal species distributed between male and female participants between three age categories (69–79, 80-90 and 90-100 years of age) was comparatively analyzed by using Chi-square.

IV. Results

Socio-demographic characteristics of participants

Communally 35 participants were selected from several villages of Sekhukhune district ,Limpopo, South Africa. The majority of traditional healers were males (71%). Based on age, the participants were divided into seven groups ,36–46 (8%),47–57 (17%), 58–68 (20%), 69–79 (32%), 80-90 (17%) ,90-100 (6%). Participants constitute, 30 herbalists, 4 retirees and 1 housewives . Regarding education, 29% of the participants were uneducated, 37% of the had attended primary school, 20% secondary education level, 6% tertiary education and only 8% of participants had attended universities. The majority of traditional healers (44%) in the study area were married, followed by single (37%), widowed (17%) and 2% divorced. Most of the participants were living in rural areas (91%) and only 9% living in urban areas, the plant flora was herbs 51%, followed by shrubs (23%)followed by trees (18%) and lastly climber (8%).The 20 invasive alien medicinal plants belonged to 14 families, with Asteraceae (3 species) represent the most dominant family in this survey site followed by Fabaceae, Myretaceae, Cactaceae, Bignoniaceae with 2 species (table 3).

Informants' knowledge

Our investigations recorded four respiratory illness. The most important of them affect mainly the respiratory system. Seven of these diseases (pneumonia, TB, fever, corona, cough, influenza) were identified as the most frequent respiratory ailments in the bapedi community with covid-19 pandemics worsening matters of health in humans. Local people used 20 different invasive alien medicinal plant species belonging to 14 families to treat these six respiratory. About 20 % of the 20 species are known by at least ten informants(*Eucalyptus camadulensis, Cannabis sativa, Datura stramonium, Senna didymobotrya, Ricinus communis, Psidium guajava, Opuntia ficus-indica)*. All 20 species were used to treat more than one ailment.

Most of the species were used to treat coughing and influenza. Only one invasive alien medicinal plants were used for Asthma treatment. People often consulted a doctor for these two serious ailments. Table 1 gives the informants' knowledge according to demographic variables. Men cited more plant species as used than women. This might be a residual effect of the higher number of male informants interviewed and high number of female not traceable during interview times. However, it should be noted that the one widowed informant had an important knowledge by citing nine species, nearly two species for each of the four ailments she cited. When comparing traditional healers and simple informants' knowledge on plant species used to treat the most frequent respiratory diseases on animals were the same. This means that both informant groups cite almost the same amount of plants used to treat each respiratory disease. Therefore, difference was only found among the gender setting. No difference was found between traditional healers and simple informants' knowledge, which means that the more these diseases are frequent, the more people get to know plant species used to treat them. As such, the local population did often not consult traditional healers or the local doctor except for treating animals

Respiratory infections treated and their vernacular names

Bapedi traditional health practitioners (THPs) reported treating six respiratory infections. These included Fever, influenza, coughing, Asthma, Pneumonia, TB,. Bapedi THPs called Fever is Mokomane in sepedi language, the influenza was known as mpshikela, coughing as a Mokgohlwane, Asthma as a Go thibega Mafahla, Pneumonia sehuba, TB sehuba se se golo.. All was a seasonal-bound disease except TB which occur in immunocompromised people or animal especially calf/children and HIV/Aids people.

Used categories in respiratory infections

In this survey, the respiratory infections were assembled into six groups. The category includes (Figure 3). In this study, the maximum figure of plant was used in handling for Flu (20 species) followed by Coughing (18 species) and Fever (7 species). Other important respiratory ailments treated by invasive alien plant flora in the area were, pneumonia (3 species) and TB (2 species) followed by asthma (1 species).

Life form

The most dominant life form (Fig 4) uses in the study was herbs. Herbs are easily available and collected from roadsides and farmlands [140]. Asteraceae was the most preferred family used. Previous work [3] also reported Asteraceae (6 species), Lamiaceae (6 species) and Fabaceae (5 species) with large figure of medicinal flora. There seems to be a tendency for a few families of plants to stand out in any pharmacopeia .These plant families have been reported with high pharmacological organoleptic and pharmaceutical properties [140]. The fewer species were observed in 37 families that are similar to previous studies [140]

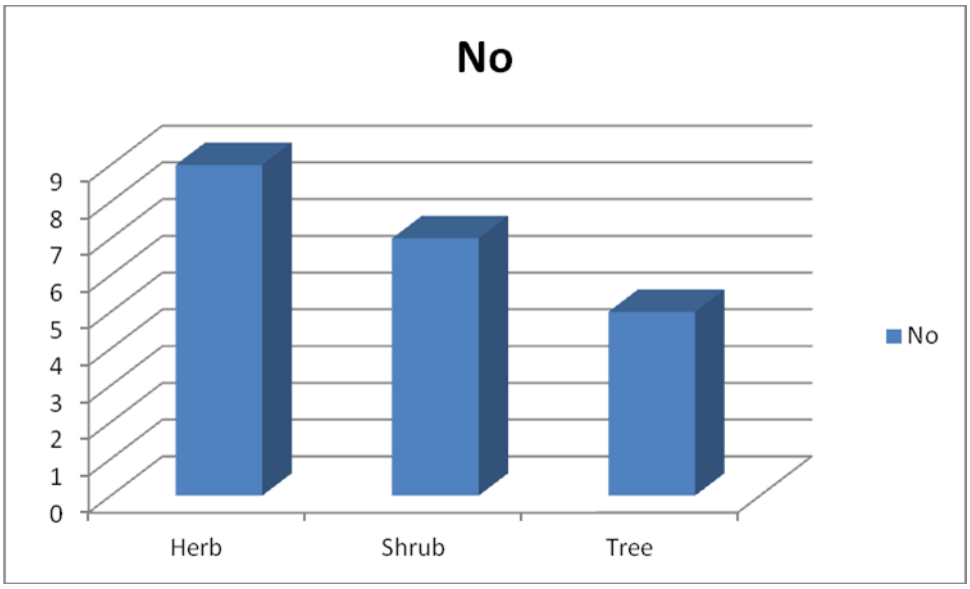

Figure 4 Life form

Plant parts used in herbal medicines

Leaves (85%) were reported to be the most frequently used plant part to prepare herbal medicine either by singly or mixes by other plant parts. Leaves were followed by roots(20%),whole(15%) followed by bark and seed with (10%) contributed (Fig.5).

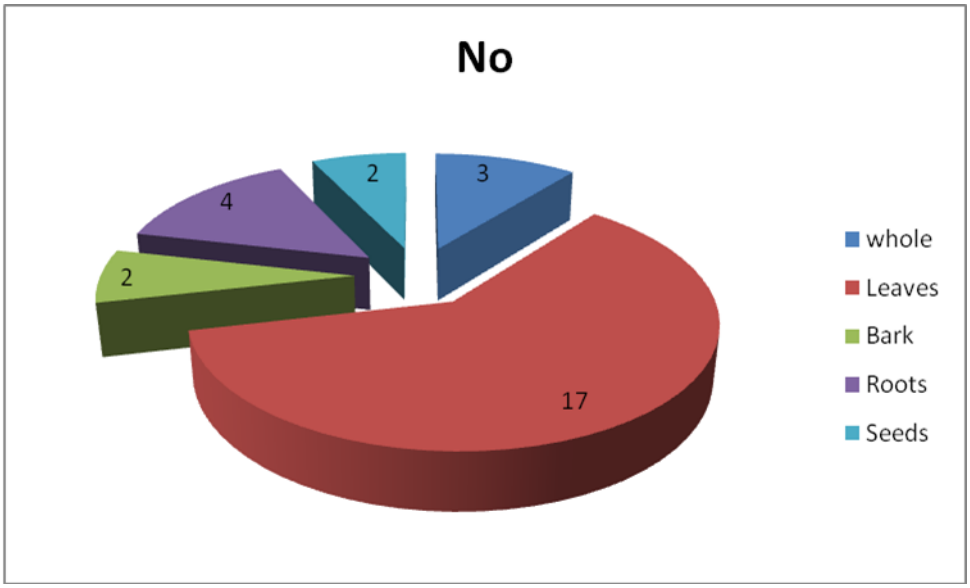

Figure 5 Parts used

Collection sites

Alien Plants were mostly harvested from roadsides (41%), followed by Abandoned land(23%), disturbed habitats(15%),home gardens (10%),mountain 8% and Rivers 3% as sources of medicinal plants (Fig. 6).

Collection sites of invasive alien plant in Sekhukhune District

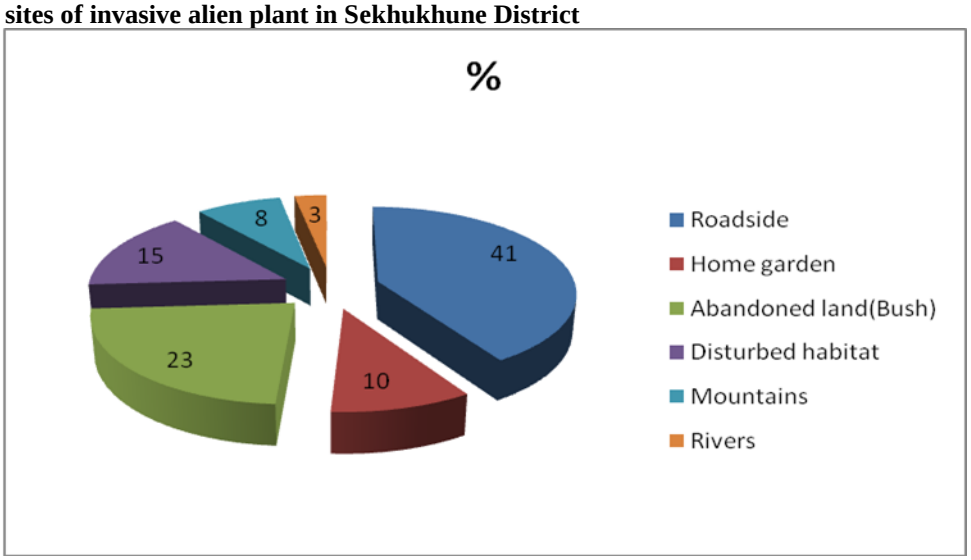

Figure 6 Collection site

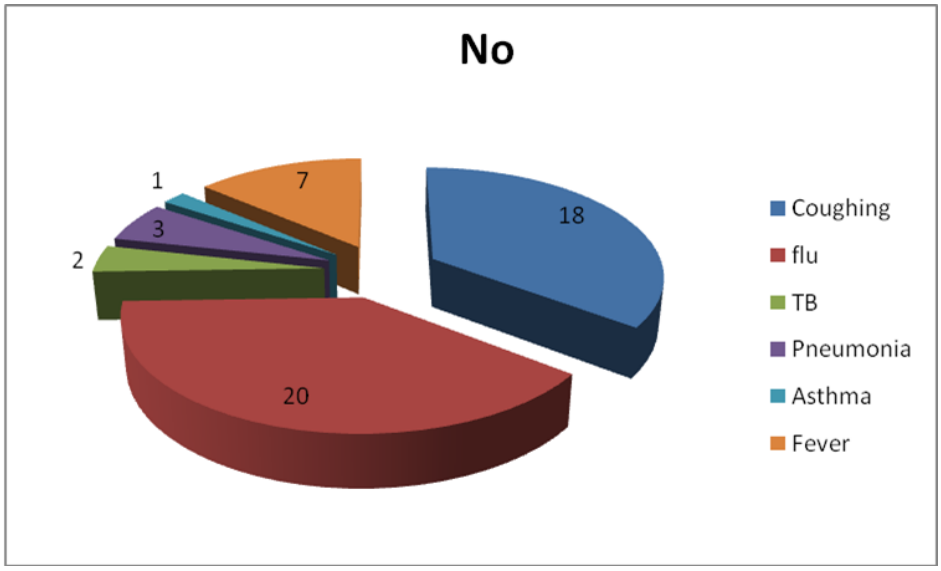

Figure 7 Symptoms of Respiratory infections

Toxicity of plants

Preliminary in vitro screening of some of the few mentioned invasive alien medicinal plants have been mentioned to validate the common use, findings of the present study. In spite of the wide application of active metabolic compounds for humans and animals they also have a physical condition harmful effect because of much toxins. These substances not only hinder with the growth of parasite also have deadly effects on mammalian cells. It is, therefore, important to validate the toxic effects of medicinal plant products in relation to their side effects .It was noted that 75% of traditional health practitioners reported that invasive alien medicinal plant remedies were not toxic for mammals. However, 25% reported that some of the plant remedies could induce death, dizziness, diarrhoea, skin irritations and vomiting when overdosed. Agave sisalana was reported to induce diarrhoea. [15] Skin contact with milky latex from R. communis was reported by traditional health practitioners to induce skin irritations. Although the administration in the later was oral compare to the current which is topical the toxicity should be noted when using many plants.

Quantitative ethno veterinary analysis

Fidelity level

High FL was observed for treatment of coughing and flu. The plant used *Psidium guajava* (83), *Schinus molle* (97), *Eucalyptus camadulensis* (100), *Datura stramonium* (80) , *Canna indica* (74), *Senna didymobotrya* (94),*Cannabis sativa* (100).*Lantana camara (0,54), Ageratum conyzoides(0,46)* and *Agave sisalana (0,46)* had high FL values on fever, *Argemone ochroleuca (0,71) the only use for Asthma* (Table 2).

Use value

Plants with the highest UV values were *Cannabis sativa* (1) , *Eucalyptus camadulensis* (1), *Schinus molle* (0,97) and *Senna didymobotrya* (0,94).The lowest UV was on *Tecoma stans* and *Opuntia ficus-indica* each with a UV value of 0,26 and 0.29 (Table 2). Use value calculation of *Cylindropuntia fulgida and* Jacaranda mimosifolia was not considered because of less than five use-report.

Informant consensus factors

The number of use-report revealed that Coughing (0,9) and flu(1) was the most treated, followed by fever(0,3) and Asthma (0,05). The highest ICF values were cited for Coughing (0,9) and flu(1) with *Cannabis sativa*(0,96) , *Eucalyptus camadulensis* (0,94), and *Schinus molle* (0,91) being the most frequently used species. The category of plants used for the treatment of Asthma showed the lowest ICF value of zero (Table 2).

Relative frequency of citation (RFC %)

The RFC represented the prominent species used for respiratory related infections based on the ratio between the number of participants (FC) for a plants and the overall number of participants in the research survey. RFC ranged from 0 to 1 and we classified all species into 3 groups: RFC 0. to 0.35(0-12,5) (5 species); RFC, 0.357 to 0.711(12,5-24,9) (7 species); RFC 0.714 to 1 (25-35) (8 species)

(Table 2). According to this ethnoveterinary records, the majority of plants in the third group were reported with high medicinal potential. The highest values were recorded for cannabis sativa (1) used in the form for Coughing, influenza, Fever and TB. Other high RFC species were *Datura stramonium, Eucalyptus camadulensis, Schinus molle, Canna indica,* Psidium guajava.

Family importance value (FIV)

The analysis of family importance value reported to Asteraceae has the maximum FIV (15.%), followed by Fabaceae (10%), Myretaceae (10%). Cactaceae(10%) Bignoniaceae(10%).Lowest values were observed for Papaveraceae, Verbenaceae,Agavaceae,Euphorbiaceae,Solanaceae,Cannaceae,Cannabaceae,

Hypericaceae, Anacardiaceae(Table 3).These invasive alien medicinal plants are exploited equally by all the communities on a normal basis and the folk information is consistent. The review of the literature showed that invasive alien medicinal plant species share uses fluctuated from different area to area .The lowest degree of similarity was found in the studies reported Vhembe, Waterberg, Eastern Cape on types infections by [5,11–15,18,20].The comparison was based on use of invasive alien medicinal plants reports in several survey, presenting the usage of therapeutic plants for the cure of different infections in local communities.

Jaccard index (JI)

A comparison of medicinal uses of plants was made by analyzing 50 research papers from aligned countries only looking at alien species use for medicinal in 25 and respiratory infections in 25 as it is impossible to find both in one research paper. The review of the literature showed that 20 reported medicinal plant species share similar uses fluctuated from 0% [39] to 12.2% while nonsimilar usage from 3.7 [64] to 0% [70] in human only ,as animals use of this plants were never exploited. The lowest degree of similarity was found in the studies reported in India, Pakistan, Lesotho and South Africa on respiratory infections of alien us use in ethnoveterinary [5,63, 93]. The comparison was based on invasive alien medicinal plants reports in several study, but in this survey presenting the usage of curative of invasive alien medicinal plants for the cure of respiratory infections in animals by local communities which can also benefit the control of invasive alien species.

Chi-square test

The male participants reported more medicinal plants than women, and it could be stated that males possess more knowledge about the use of medicinal plants than women ,also the respond turn up of male was high than female showing confidence in terms of their medicinal knowledge. The chi-square on the number of species of plants reported by the three age categories showed important differences. Table 2 represents the median for a number of medicinal species reported by the participants 69–79, 80-90 and 90-100 years of age. Scattering of knowledge was observed in different age groups with the older showing more knowledge and are often reference by other groups that was the reasons to add them to replace some of participants who could not turn up for interview. The significantly higher average number of medicinal plants ($p < 0.05$) were mentioned by participants of 69 to 79 years (37.88) for men and (24.1) for women, respectively. There were no significant variations ($\chi 2 = 13.45$; $P > 0.05$) in the < 36 year age group. Analysis of variance ($p = 0.05$) was used to elucidate the effect of gender, age, and gender to gender interaction on the traditional knowledge of plants in society.

Individual versus combination use

Table 4 most common combinations

Infections	Elias Motswaledi	Ephraim Mogale	Tubatse	Fetakgomo	Makhuduthamaga
TB	Aloe Marlothi+19	Aloe Marlothi+12	Aloe Marlothi+19	Aloe Marlothi+19	Aloe Marlothi+19
Fever	1+5	2+5	6+4	3+1	12+1/11
Pneumonia	19+17	17+12	17+19	17+19	19+17
flu	9+13	9+14	9+15	9+10	9+ Aloe Marlothi
Coughing	19/12+1	19/12+2	19/12+17	19/12+2	19/12+1

Preparations of the remedies constituted 8 individual extracts from 8 species depending on the infection and 27 combinations with 12 species were recorded 5 species with one indigenous species across different municipalities (Table 4).

Species that were used individually include *Tithonia rotundifolia, Tithonia diversifolia, Schinus molle, Ricinus communis, Canna indica.* Fifteen species *Cylindropuntia fulgida, Argemone ochroleuca, Hypericum perforatum, Senna didymobotrya, Opuntia ficus-indica, Tecoma stans,Ageratum conyzoides, Datura stramonium , Cannabis sativa, Psidium guajava , Agave sisalana, Lantana camara* were used individually and in combinations. Only prominent combination and common or well known combination were recorded. Traditional health practitioners prefer combinations generally as they say it prevent feather infection and reduced toxicity in those plant that have toxicity.

Mode of preparation Administration and dosage

Except the remedies prepared from *Schinus molle*, which were administered through fumigation of animals or human (via a burning of smoke), all preparations were prescribed orally with a tin cup (300 ml) goats/sheep and human or two litre for large animals like cows or donkey (Table 2). The preferred vehicle for administration of pounded/powdered oral medicine was either warm water or cooked and allowed to cold down and other mixed with food or administered as feed. Same medicinal remedies were taken until a animals health show a positive signs. The improvement of symptoms was perceived as independent indicators of a successful treatment of respiratory. The traditional health practitioners reported powder and juice administered orally as a method of choice that will not destroy active compounds, ultimately resulting in high efficacy. Explanations such as speeding-up the extraction process, extracting active compounds and cytotoxic evaluation of compounds are central goals in phytomedicine studies [74]. In Zambia [88] , preparation methods depended on types of infections symptoms such as Coughing, flu and fever.

Medicinal plants are subjects to phytochemical screening worldwide. All traditional health practitioners used water, which is limited to extract non-polar and intermediate polar compounds. The aqueous extracts may result with limited biological activities. Nevertheless, the nontoxic solvent such as acetone was excellent in extracting a wide range of compounds [91] .The dosage administered was consistent with previous studies of human and but the application only twice time as animals in rural move to the bush early and return late. This suggests that traditional health practitioners have some model dosage measurement of remedies being administered for a particular set of infections on different types of animals.

Comparison with other studies in neighbouring regions

In the present survey, some plants were used alone to treat the particular infection, while in some cases plant parts were mixed to treat diseases. This present study reported 20 alien plants from 14 families for respiratory infections on animals from Sekhukhune, Limpopo South Africa.

Previous literature on use of this invasive alien plants

Argemone ochroleuca Stem and roots purge diabetes [95].*Caesalpinia decapetala* Leaves are used for the treatment of burns, biliousness and stomach disorders. Leaves and roots are also used as a purgative and emmenagogue [96,123].The most promising plant *Canna indica* was one of the Thai traditional remedial plants used to treat AIDS tested for their human immunodeficiency virus type 1 reverse transcriptase (HIV-1 RT) inhibitor activity. Woradulayapinij *et al.* studied and reported *Canna indica* rhizomes showed HIV-1 RT inhibition ratio >90% at 200 bug/ml concentration. Further study of *Canna indica* and two proteins isolated showed significant HIV-1 RT inhibition [99]. *Datura stramonium* Leaf paste and extract is externally used for injuries, wounds, bleedings and pains. Seeds in small quantity used for asthma and tonsil problems. The extract of leaves is also used for baldness[100],leaves used externally for management of pains[101].

Schinus molle is used as anti-rheumatic, anti-septic, anti-inflammatory, antifungal, antimicrobial, wound healing, in the treatment of disorders related to skin[106]. In the same survey *S. didymobotrya* was one of the most highly utilized plant species for management of various skin conditions. In Kipsigis community, it's used in the management of opportunistic fungal infections, malaria, diarrhoea, skin infections in humans [110,111]. Leaves

of *Psidium guajava* were reported to treat sexually transmitted infections [15], while current study revealed that leaves can be used for respiratory problems which also includes feeding them to week animals to prevent respiratory infections. The wound healing properties of a methanolic leaf extract of *Psidium guajava* were determined using the excision wound model. More than 90% wound healing was observed after 14 days post-surgery, whereas 72% healing was observed in the distilled water treated group [112].Pre-treatment test in rats revealed a protective action against ethanol-induced ulcer [114]. *Agave sisalana* Intestinal stimulator and uterine musculatoe, hypotensive, abortifecient, skin diseases and liver diseases [104] *Agave sisalana* was reported for the treatment of STis [13], but the current study reported it for respiratory infections.*Tecoma stans* and lemon juice is reportedly used as an external application and also taken internally in small quantities as a remedy for snake and rat bites [126]. *Ageratum conyzoides* In some African countries, the plant has been popular use for skin diseases, wound healing, mental and infectious diseases, headaches and dyspnea,[119,120,121,122] and used in traditional medicine for its anti asthmatic, antispasmodic and haemostatic effects, [121] uterine troubles, pneumonia by rubbing them on the chest of the patient.[122] Plant leaf juice to treat cuts and wounds and applied on skin diseases as an antiseptic. Leaves for treating typhoid and as a snakebite antidote. Fomented leaves and stems in leprosy. [116,117,118] *Jacaranda mimosifolia and Ricinus communis* reported for the use in treatment of sexually transmitted diseases in Limpopo [15].Roots of *Opuntia ficus-indica* were reported for sexually transmitted infections in the earlier studies of [13], these results are in contradictory with the present study where roots, leaves and the whole plants is use respiratory infections [86].

Tithonia diversifolia weed is used in Venezuela to treat abscesses [129]; in Mexico for malaria, hematomas and muscular pain, and India this plant species is applied topically as poultice or bath to wounds, bruises, skeleton muscular disorders, abscesses, dermatological conditions, and stomach pains[130,131,132] in Taiwan for diabetes[133] ; in Kenya for malaria and as an antidote for snake bite and to treat ectoparasites in cattle and to improve appetite[39]; in Uganda for microbial infection in sexual organs[135]; and in Nigeria for malaria [136].Wound healing property of aqueous extract of leaf of *Lantana camara* was reported in rats. Topical application of the extract on the wound (100 mg/kg/day) significantly enhanced the rate of wound contraction (98%), synthesis of collagen and decreased wound healing time. [138] The leaves of *Lantana camara* have been used for sexually transmitted infections in a study of [13,15,18], but in current study renowned that the leaves can be used for respiratory infections. Ethanol extract of leaf of *Lantana camara* was reported for wound healing activity in adult male Wister rats. Topical application of the extract over the wound significantly increased the wound healing activity. Histological analyses of healed wounds confirmed the role of extract in healing. [139]. *Tithnia rotundifolia* has only been reported to be used as a source of medicine to treat fever in Venezuela[129]. Some compounds, including germacranolides, eudesmanolides and flavonoids have been isolated from this weed [137]. In northeastern India, some of the plants species including *Cannabis sativa* have been used for the treatment of specific human ailments such as allergies, burns, cuts and wounds, inflammations, leprosy, leucoderma, scabies, smallpox and sexually transmitted diseases [128]. Cannabis sativa was used to management of asthma, depression, hypertension, respiratory, multiple sclerosis and psoriasis problems [85]. *Eucalyptus camaldulensis* is used as a remedy for sore throat and other bacterial infection of the respiratory and urinary tracts. Essential oils of the leaves are used in the treatment of lung diseases while the volatile oils are used as expectorants [127].

V. Discussion

This survey was carried out in the inhabitant groups of Sekhukhune, Limpopo South Africa. People use plants medications for the treatment of several diseases. Generally the medicinal plants are used in village parts of the area. The common traditional healers in this survey were males, this finding is similar to the literature [42,47]. According to an estimate, 80% of the rural population relies on herbal traditional medicinal plants [43], diverse birth of the therapeutic plant information were recorded. The inherited knowledge of medicinal plants is transferred through orally a cultural practice common in the rural areas. Most people inherit traditional knowledge from their elders that passed generation to generation [44]. The most dominant life form uses in the survey was herbs. Herbs are easily available and collected from roadsides and abandoned land . Asteraceae (3 species),and Fabaceae, Bignoniaceae, Cactaceae, Myretaceae (2 species) with high number of medicinal flora. These plant families have been reported with high pharmacological, areas [45]. The use of powder cooked in water was the main mode of utilization in the herbal preparations for oral in the ethno medicinal survey due to the nature infections of animals [40, 46].The preparations were applied 2 times daily until healing occurred. A large number of herbal preparation involved soaking gridded powder the plant material in hot water or cooking for 15 minutes allowed to cold down few hours and administered it, while few involved boiling the parts of giving then to animals. Treatments were done with single plant parts or a combination of different parts of the same plant. The amount of powder used to make a concoction was defined as a half, full or a quarter of a teaspoon. In the morning, the mixtures were regularly used before animals released to the bush for grazing or afterward their arrival, for 3-7 successive days, or till the animals was completely cured. The invasive alien medicinal plants described in this study for the cure of respiratory infections might also be utilized additionally for their phytochemical and

pharmacological activities. Following reports carried out in various areas also described the common practices of medicinal species usage against the different infections [22, 39, 41].

The recent survey represents a high level of novelty index with respect to the use of invasive alien medicinal species in respiratory infections and its significance in native traditional recipes [83] individual in his study work that the medicinal plants repeatedly cited must be utilized as herbal drug development. The comparison of similarities shows the significant authenticity of documented data. Similarly, the medicinal plants which are not cited in previous work should be assessed for pharmacological and phytomedicinal analysis for prescription innovation development. Mostly all the species had been described previously for their one or more important compound representing their importance in medicinal cures for other infections in human .Breakthrough of treatment from invasive alien medicinal plants associates a multidisciplinary approach to joining pharmacological, botanical, ethnomedicinal and natural methods. A number of ordinary products of plant derivatives are in the phase of the testing and are in experimental exploit [84]. Consequently additional pharmacological, ethnoveterinary and phytophamacological studies should be accepted elsewhere to authenticate the use of plant species in skin infections and to realize new drugs.*Cylindropuntia fulgida* was used for respiratory in areas of Sekhukhune, Limpopo South Africa. The medicinal use of species was not reported earlier. The present work therefore recommend that public sector administrator in study area should make policies in order to protect people from health problems and use of invasive alien medicinal plants by local people for treatment of diseases as part of controlling or introducing natural enemies to invasive alien.

Previous literature on toxicity

Medicinal plants are an fundamental part of the African healthcare system ever since time immemorial. Interest in traditional medicine can be explained by the fact that it is a essential part of the customs of the individuals who use it and also due to the monetary challenge: on one side, the pharmaceutical drugs are not accessible to the poor and on the other side, the richness and diversity of the fauna and flora of Africa are an unlimited source of therapies for panoply of ailments [94]. Nevertheless, there is still a scarcity of clinical evidence to show that they are effective and safe for mammals. Abuse and over consumption of medicinal plants without correct or proper instructions may be mutagenic or cytotoxic over long-term usage [71]. All of the alien invasive medicinal plant species acknowledged in the current survey have been studied for cytotoxicity [75,68,80,81], except *Schinus molle,Jacaranda mimosifolia,Cylindropuntia fulgida and Argemone ochroleuca.* Acute toxicity studies conducted by [66] revealed that the administration of the hydro alcoholic extract of *Agave sisalana*,leaves (up to a dose of 2000 mg/kg) did not produce any adverse effects and significant change in the behaviour of the animals. No death was observed up to the dose of 2000 mg/kg body weight and the experimental animals were physically active. It indicated that the median lethal dose (LD50) could be greater than 2000 mg/kg body weight. Phototoxicity has been reported in cattle after ingestion of *Hypericum perforatum* during grazing. However, the doses were estimated to be approximately 30-50 times higher than normal therapeutic doses [64].Drug-monitoring studies indicate that side-effects of the herb are rare and mild, and include minor gastrointestinal irritations, allergic reactions, tiredness and restlessness. Clinical studies have suggested that the use of the herb does not affect general performance or the ability to drive [65] . *L. camara* reported to have an acute toxic effect and *R. communis* cause hepatotoxicity [63,72,74]. *Lantana camara* is one among the most toxic plants known so far, possibly within top ten. Reports of *Lantana camara* toxicity have been reported from Australia, India, New Zealand, South Africa and America. However, the toxicity occurs only on the consumption of high amount of plants material. It is reported that sheep, cattle and goats are susceptible to lantadenes A, B, D and icterogenic acid toxicity, where as horses, rats, neonatal calves and lambs are not susceptible to lantadene A [63] *Ageratum conyzoides* The pollination season of the plant causing allergy has been found to be between November and January in Delhi. In another study, Ageratum (species not mentioned) pollen were reported to be cause of nasobronchial allergy in 5 out of 50 patients [59].Some preliminary specific experimental studies provided no evidence of toxicity when a dosage of 1 g per kg of body weight was injected into mice[58]. In the toxicological study [72], two invasive alien plants, *Psidium guajava* and *Ricinus communis*) from the current survey were investigated for their toxicity, mutagenicity and hepatotoxicity, while aqueous extracts of *P. guajava* and *R. communis* did not show hepatotoxicity [72]. Extracts from the other plants were either inactive or only moderately active.

It was furthermore found that organic leaf extract of R. communis was more toxic towards brine shrimps, while organic and aqueous leaf extracts of P. guajava were not toxic. Lower and higher concentrations of aqueous leaf extract of *P. guajava* and *R. communis* are not cytotoxic but protective on liver cells (hepatoprotective) [69,78] The hepatoprotective effect of aqueous extracts from *P. guajava* and *R. communis* validate the claim from traditional health practitioners that plant remedies are not toxic. *Agave sisalana* was reported in the current study to induce diarrhoea. Skin contact with milky latex from *R. communis* is reported by traditional health practitioners to induce skin rash. Van Wyk et al. (2002) [70] confirmed the intoxication of the above-mentioned plant species. The toxicity of organic and aqueous extracts depends on the dosage, period of consumption and poisonous

compounds in plant species. Despite the cytotoxic effect of leaf extracts of *R. communis*, organic and aqueous root extracts did not show any acute and sub-chronic toxicity towards albino rats[79]. This suggests that cytotoxicity of plant species is also dependent on the plant part used. Ramulondi (2017) [72] proved that organic root extracts of P. guajava were cytotoxic towards brine shrimps, while organic leaf extracts were not. Abbas et al. (2018) [67] further reported that extraction methods have significantly affected cytotoxicity level of *R. communis.* Different plant parts and extraction methods revealed varying compounds and concentrations of secondary metabolites [67]. Communities in Zimbabwe have learned how to prepare some of the documented poisonous species [73] .Kamau et al. (2016) [77] reported that traditional health practitioners in Kenya neutralised toxic plant species by adding milk, fats and combining with other plant species. In the current study, Bapedi traditional health practitioners reported that subjecting plants to decoction was to detoxify poisonous compounds, extract active compounds and decontaminate the plant material. Therefore, the assumption that plant-based remedies are safe and present no side effect is untrue. Plant remedies prepared by traditional health practitioners should be evaluation for their cytotoxicity against different cell lines to establish safety standards.*Datura stramonium* was established that the intoxication was accompanied by hyperchromaemic, erythrocytosis, leukocytosis, neutrophilia and regenerative shift, lymphocytopenia, aneosinophilia, increased haematocrit values and low erythrocyte sedimentation rate .

All parts of the plant are toxic but the highest amount of the alkaloids is contained in ripe seeds [51].They act as competitive antagonist of acetylcholine at peripheral and central muscarinic receptor sites. Poisoning results in widespread paralysis of parasympathetic innervated organs [50]. Datura aqueous leaf extract-induced cytotoxicity & oxidative stress in human cancer cell lines [49].Severe toxicity has been associated with coma and seizures, although death is rare. All extracts of T. diversifolia are toxic with LC50 values far lower than 0.1 mg/ml except the hot water extract with LC50 of 0.275 mg/ml [48] . All extracts of *Tithonia rotundifolia* tested were classified as being less toxic to non-toxic [48].*Cannabis sativa* ethonol extract [82] show no evident effects on survival were registered with 0.78 mg/mL hemp EO up to five days after treatment. The lethal dose (LD50) of Hemp EO was 1.56 mg/mL in the first 48 h of treatment, probably due to the lipophilic nature of the EO with respect to the larval biological fluids and the invasive administration procedure. The LD50 of 1.56 mg/mL was higher than the effective concentrations reported by us against cell lines (22.3–250 g/mL), but in the same range as those found active against S. aureus strains (8–24 mg/mL). In this case, the putative topical administration of the hemp EO to combat S. aureus wound infections guarantees a discrete safety index with respect to the parental administration in G. mellonella larvae. All the toxicity testing in the literature have only look at single use of plant which results in repeated toxicity and cytoxicity using only different method, it will be in the best interest of drug development if the toxicity of combination can be tested. *Caesalpinia decapetala* the results achieved in measuring the acute toxicity represented no change in weight and/or behaviour of the animals (data not shown). No animal was died during the acute toxicity studies [68].The cytotoxic effects of essential oil of *Eucalyptus camaldulensis* was evaluated in different cancer and normal cell lines, the essential oil showed high potent cytotoxic effect on colon, prostate and breast cancer cell lines as well as moderate potency against liver and lung cell lines with IC50 19.8, 31.5, 34.9, 51.7 and 64.0µg/ml respectively. In the same pattern, the oil showed high cytotoxic effect on normal epithelial retina cell line and moderate effect on normal skin fibroblast cell with IC50 41.3 and 60.6µg/ml respectively [125].

Opuntia ficus-indica There were no gastrointestinal side effects reported from the clinical studies reviewed above, with the consumption of about 3 g of Litramine IQP-G-002AS a day for up to 24 weeks. There were also no clinical changes observed from blood parameters such as full blood count and clinical chemistry. Furthermore, the intake of Litramine IQP-G-002AS for 12 weeks had not resulted in any clinical relevant changes on the serum fat soluble vitamins (A, D, and E) [124] Cytotoxicity is toxic to cells. The cytotoxicity of *Tecoma stans* in human hepatoblastoma was determined by incubating the cells up to 72-hours and changing with concentrations of herbal extracts. Toxic effects of *Tecoma stans* were originated to be attentiveness and time dependent in the presence and absence of fetal bovine serum [126]

Individual versus combination use

Invasive alien medicinal plants were used either alone or in combinations with indigenous and naturalised alien plants to enhance the efficacy of remedies. In the current study, 49% of remedies were individually prepared from just one species. One can speculate that plants used individually are more potent than those used in combinations and also the fact that invasive species have invaded up to 50 % in the area. Most importantly can be that that the Traditional health practitioners have become the natural enemies of the invasive alien medicinal plants which provide a good management of alien plants for the ecology to resurrect indigenous species.

Traditional health practitioners around the world have relied on combinational therapy to enhance efficacy [89]..Similarly, traditional health practitioners in Zambia used some medicinal plants alone, but combinations with other plant species were noted [88] .In the synergistic studies, plant extract can possess antimicrobial activity when tested alone, while the combination plant extracts could either result in synergism,

additive, non-interactive and antagonistic activities [87] .For instance, Naidoo et al. (2013) [87] elucidated the synergistic interaction of *Albizia adianthifolia* and *Trichilia dregeana* towards the urethritis causing pathogen viz. *Oligella ureolytica*. The insufficiency of native medicinal plants could have confident traditional health practitioners to combine available invasive alien medicinal plants with naturalised alien species.

This is because invasive alien plants were easily accessed in roadsides, abundant land and home gardens. The use of invasive plant species with naturalised ones is a sustainable way to allow recuperation of scarce indigenous plants [15]. This demonstrates that a combination of invasive alien plants with naturalised species can be an important practice in conservation areas [15].

Collection sites of invasive alien plant in Sekhukhune District

Plant species were collected by traditional health practitioners from the abandoned land, disturbed habitats, roadside, mountains, rivers and from home gardens. The high proportion of roadside collection indicates easy access for harvesting. This is because most of the indigenous species used to treat infections are collected from the communal lands and are scares and declining[29]. Home garden plants were not only used for medicinal purposes and for food, but also for aesthetic values such as for decorative and gloom. For instance, O. ficus-indica and P. guajava were also cultivated for their healthful fruits. Therefore, roadsides and home gardens serve as alternate medicinal plant source. *Lantana camara, Datura stramonium* was found in disturbed habitat. *Cannabis sativa* found in the mountains and far next to rivers which indicate human activity as introducer to the environment. According to the National Environmental Biodiversity Act (Act No. 10 of 2004), it is prohibited to spread, grow and sell or trade any listed invasive species. Most of invasive alien species are found along the road and home garden. This indicated that humans are the main introducers of alien plants. Semenya et al. (2012) [13] noticed that 68.5% of alien plants in Limpopo Province were found near homes (roadside) as weeds or as cultivated plants in home gardens as ornamental or food plants. This is show lack of awareness to the public, particularly to the traditional health practitioners. If more harvesting of alien plants is done in the area the indigenous plants will have an opportunity to grow. This will conserve scarce indigenous plants and thus rescue the biodiversity of the district. [15]. The challenge was that traditional health practitioners could not differentiate between invasive alien species and indigenous ones [15], hence in this survey the picture from SANP was use to identify them and physically identifying them for the uses It is important that traditional health practitioners be educated about invasive alien plants and their impact on the ecosystem [15], and be encourage to only harvest them not to grow them in the home garden.

Qualitative ethno veterinary analysis

Fidelity level

Plant species such as *Tecoma stans* and *Opuntia ficus-indica* were not necessarily important in management of respiratory infections due to a low number of use reports [38].Plants with one use report such as *Cylindropuntia fulgida and* Jacaranda mimosifolia were not computed for Fidelity Level (FL) due to one use-report. Important plant species with high FL values and with a considerable number of use-report were *Cannabis sativa*(1) , *Eucalyptus camadulensis* (1), and *Schinus molle* (0,97).These plants need further antimicrobial studies against pathogens of respiratory infections.

Use value

The plants with the highest Use Value (UV) were considered important due to high use-reports. Despite being considered important,[38] noted that the UV cannot distinguish if the plant is used for single or multiple purposes. Despite that, the FL values indicated the importance of plant species to various respiratory infections.

Informant consensus factor

Psidium guajava , Schinus molle, Eucalyptus camadulensis, Datura stramonium, Canna indica,Cannabis sativa showed the highest Informant Consensus Factor (ICF) (1) due to common observation of traditional health practitioners. This implies that there was a 100% degree of agreement that species above was used to treat common cold, to acute infections such as bacterial pneumonia, bronchitis and chronic conditions like asthma or chronic obstructive pulmonary disease. Schinus molle was the most preferred species to for respiratory infections where burning of leaves or fumigating was use with due to the highest number of use-report. *Psidium guajava , Eucalyptus camadulensis* was the most preferred species to for respiratory infections where forced feeding of leaves was administered to animals .Plant species with high ICF value indicate further pharmacological investigations [38].This could lead to promising bioactive compounds that may serve as alternative antibiotics that counter resistance.

VI. Future Directions

Although many invasive plants are metabolically insecure and toxic to humans, but in diverse tribal pockets of the globe, these species are benefit for their ailments and many bioactive phytoconstituents are to be consume from them in future. People, habitually, discriminately exterminate these weeds without being aware of their hidden riches of medicines. While invasive plants may be outsider here, but in their native land surely they contribute in different aspects like medicine, food, decorative, construction, etc. These are genius in taking over other flora and may help in offering proficient nourishment to the populace than the cultivated ones. They can be a better nourishment source than the cultivated ones. Encouragement for their edibility can promote their proper utilization and management with a worthwhile scope in. Furthermore, this requires antioxidative and pharmacognostic investigation to explore out their priceless secondary metabolites, which may compete synthetic medicines in future. Basic ethnoveterinary acquaintance in this statement may help out many future researchers to evaluate different parameters in pharmacognostic field. There is dire need to create awareness among local, government and scientific communities for the preservation of native medicinal species and biological control of alien plants using ethnomedicinal knowledge in Sekhukhune, Limpopo South Africa.

Acknowledgement

All traditional health practitioners and livestock owner who participated in this study are highly thanked for sharing their knowledge.

Funding
Not Applicable.

Availability of data and materials
Not Applicable.

Ethics approval and consent to participate
Not Applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

References

[1] Abu-Rabia A. J Ethnobiol Ethnomed. 2005; 1, 4.
[2] Abbasi Am, Khan Sm, Ahmad M, Khan Ma, Quave Cl. J Ethnobiol Ethnomed. 2013; 9, 84.
[3] Martínez Gj, Barboza Ge. Natural Pharmacopoeia Used In Traditional Toba Medicine For The Treatment Of Parasitosis And Skin Disorders (Central Chaco, Argentina). J Ethnopharmacol. 2010;132(1):86–100. [4] Balunas Mj, Kinghorn Ad.Life Sci. 2005; 78, 431-441.
[4] Torres Mp, Rachagani S, Purohit V, Pandey P, Joshi S, Moore Ed. Cancer Letters. 2012; 323, 29–40.
[5] Cowan Mm. Clinical Microbiology .Reviews. 1999; 12, 564–582.
[6] Azaizeh H, Fulder S, Khalil K, Said O.Fitoterapia. 2003; 74,98-108.
[7] Mcgaw Lj, Eloff J.N.J Ethnopharmacol. Doi:10.1016/J.Jep.2008.06.013.
[8] Pieters L, Vlietinck Aj.Journal Of Ethnopharmacology .2005;100, 57–60.
[9] Germishuizen G, Meyer Nl National Botanical Institute, Pretoria. 2003.
[10] Dold A P, Cocks Ml. South African Journal Of Science. 2000;96, 467–474.
[11] Lewu Fb, Afolayan Aj. African Journal Of Biotechnology. 2009; 8, 929–934.
[12] Semenya Ss,Potgieter Mj,Tshisikhawe M, Shava S,Maroyi A. South Africa. Journal Of Ethnopharmacology.2012;144, 646–655.
[13] Maema Lp, Potgieter M,Mahlo Sm. African Journal Of Traditional, Complementary And Alternative Medicines. 2016;13, 223–231.
[14] Maema Lp, Potgieter Mj, Samie A.South African Journal Of Botany. Doi:10.1016/J.Sajb.2019.01.012.
[15] Van Wyk B.-E, Van Oudtshoorn B,Gericke N. Briza Publications, Pretoria. 1997.
[16] Mccorkle C M. Journal Of Ethnobiology.1986; 6,129–149.
[17] Mbambala S G, Tshisikhawe Mp, Masevhe N A.African Journal Of Traditional, Complementary And Alternative Medicines. 2017;14, 80–88.
[18] Yang L, Ahmed S, Stepp Jr, Mi K, Zhao Y, Ma J, Liang C, Pei S, Huai H, Xu G.J Ethnobiol Ethnomed. 2014;10(1):6.
[19] Kose Ls, Moteetee A, Van Vuuren S. Journal Of Ethnopharmacology. 2015;170, 184–200.
[20] National Environmental Management: Biodiversity Act (Act No. 10 Of 2004): Alien And Invasive Species Lists, 2014. Pretoria, South Africa.
[21] Van Der Merwe D, Swan Ge, Botha Cj. Journal Of The South African Veterinary Association. 2001;72, 189–196.
[22] Shackleton S E, Shackleton Rt. J. Arid Environ. 2018; 159, 22–33.
[23] Shackleton C M, Mcgarry D, Fourie S, Gambiza J, Shackleton S E, Fabricius C. Hum. Ecol.2007, 35, 113–127.
[24] Pfeiffer J M, Voeks Ra. Environ. Conserv. 2008; 35, 281–293.
[25] Jernigan K. Econ. Bot. 2012; 66, 46–59.
[26] Martin M, Mathias E, Mccorkle Cm. Itdg Publishing, London,Uk. 2001..

[27] Schillhorn Van Veen T W. Intermediate Technology Publications, London, 1996; 25–36.
[28] Semenya Ss, Potgieter Mj, Erasmus Ljc. South African Journal Of Botany.2013; 87, 66–75.
[29] Kayani S, Ahmad M, Zafar M, Sultana S, Khan Mpz, Ashraf Ma, Hussain J, Yaseen G. J Ethnopharmacol. 2014;156:47–60.
[30] Yaseen G, Ahmad M, Sultana S, Alharrasi As, Hussain J, Zafar M. J Ethnopharmacol. 2015;163:43–59.
[31] Umair M, Altaf M, Abbasi Am. Plos One. 2017;12(6):E0177912.
[32] De Oliveira Pc, Braga J.J Medicinal Plants. 2017;5(1):164–70.
[33] Kayani S, Ahmad M, Sultana S, Shinwari Zk, Zafar M, Yaseen G, Hussain M, Bibi T.J Ethnopharmacol.2015;164,186–202.
[34] Musa Ms, Abdelrasool Fe, Elsheikh Ea, Ahmed La, Mahmoud A L E, Yagi Sm. Journal Of Medicinal Plants Research.2011; 5, 4287–4297.
[35] Saikia Ap, Ryakala Vk, Sharma P, Goswami P, Bora U.J Ethnopharmacol. 2006;106(2):149–57.
[36] Van Wyk B-E, Gorelik B. S Afr J Bot. 2017;110:18–38..
[37] Ong Hg, Kim Yd. Journal Of Ethnopharmacology. 2014;157, 228–242.
[38] Njoroge Gn, Bussmann Rw.J Ethnopharmacol.2007;111(2):303–7.
[39] Bano A, Ahmad M, Zafar M, Sultana S, Rashid S, Khan Ma .J Ethnopharmacol. 2014;155(2):1046–52.
[40] Harsha V,Hebbar S,Shripathi V, Hegde G.J Ethnopharmacol.2003;84(1):37–40.
[41] Amujoyegbe O,Idu M,Agbedahunsi J,Erhabor J. J Ethnopharmacol. 2016;185,347–60.
[42] Ahmad M, Khan Mpz, Mukhtar A, Zafar M, Sultana S, Jahan S.J Ethnopharmacol.2016; 184,154–86.
[43] Khan Mpz, Ahmad M, Zafar M, Sultana S, Ali Mi, Sun H.J Ethnopharmacol. 2015;173,191–203.
[44] Mati E, De Boer H. J Ethnopharmacol. 2011;133(2):490–510.
[45] Ahmad M, Sultana S, Fazl-I-Hadi S, Ben Hadda T, Rashid S, Zafar M, Khan Ma, Khan Mpz, Yaseen G. J Ethnobiol Ethnomed.2014;10(1):1.
[46] Aburjai T, Natsheh Fm. Phytother Res. 2003;17(9):987–1000.
[47] Omokhua Ag, Abdalla Ma, Van Staden J , Mcgaw Lj. Bmc Complementary And Alternative Medicine 2018; 18,272
[48] Ahad Ha, Babu Ua, Nagesh K, Kiran Ds, Madhavi Kb. Kathmandu University Journal Of Science, Engineering And Technology.2012;8(1):63-72.
[49] Friedman M, Levin E.J. Of Agri.And Food Chem. 1989;37,998-1005.
[50] Chang S S, Wu M L, Deng J F, Lee C C, Chin Tf, Liao S J. (1999). Vet.And Human Toxicol. 1999; 41,242-245.
[51] Bielawski K,Winnicka K,Bielawska A. A. Biological And Pharmaceutical Bulletin. 2006;29,1493–1497.
[52] Bnouham M, Mekhfi H,Legssyer A,Ziyyat A.International Journal Of Diabetes And Metabolism. 2002;10,33–50.
[53] Delongeas Jl, Burnel D, Netter P, Grignon M, Mur Jm, Royer Rj, Grignon G. 1983;J.Pharmacol.1983;14,437-447.
[54] Costa Rj,Diniz A, Mantovani Ms, Jordao Bq (2008).J Ethnopharmacol. 2008;1 18:86–93.
[55] Klayman Dl . Science. 1985; 228:1049–1055.
[56] World Health Organization.Tropical Disease Research Division. Who, Geneva. 2000.
[57] Taylor L .Http://Rain Tree.Com/Picaopreto.Htm. 2015.
[58] Arbat A, Patil Gv. J Soc Pure Appl Nat Sci .1985;1,5-7.
[59] Dharmananda S.Institute For Tradional Medicine- European Branch.2003;(1):1-8.
[60] Agharkar Sp.Jodhpur (India): Scientific Publishers.1991; 230.
[61] Witte St, Osweiler Gd, Stahr Hm, Mobley G. J Vet Diagn Invest 1990;2:263-7.
[62] Sharma Op, Makkar Hp, Dawra Rk, Negi Ss. Clin Toxicol. 1981;18(9):1077-94.
[63] Siegers Cp,Biel S,Wilhelm Kp. Nervenheilkunde, 1993;12;320-322.
[64] Schmidt U,Sommer H. Fortschritt Der Medizin. 1993; 111,339-342.
[65] Misra Ak, Varma Sk. J Basic Clin Pharma 2017;8,45-48.
[66] Abbas M, Ali A, Arshad M, Atta A, Mehmood Z, Tahir I M, Iqbal M. Chemistry Central Journal. 2018;12, 3.
[67] Anajwala Cc, Patel Rm, Dakhara Sl, Jariwala Jk .Journal Of Advanced Pharmaceutical Technology & Research. 2010;1, 245–252.
[68] Chen Hh, Wu Ph, Lo D, Pan Yc, Wu Mc. 2011.Food And Nutrition Science. 2011;2,983–988.
[69] Van Wyk B-E, Van Heerden F, Van Oudtshoorn B. Briza Publications, Arcadia, South Africa. 2002.
[70] Verschaeve L,Van Staden J.Journal Of Ethnopharmacology.2008;119, 575–587.
[71] Ramulondi M.Masters Dissertation. University Of Zululand, Richards Bay.2017
[72] Maroyi A.Ethnobotany Research & Applications.2012;10,45–57.
[73] El-Seedi Hr, Burman R, Mansour A, Turki Z, Boulos L, Gullbo J, Goransson U. Journal Of Ethnopharmacology.2013;145, 746–757.
[74] Tshikalange Te,Meyer Jjm, Hussein A A, Journal Of Ethnopharmacology. 2005; 96, 515–519.
[75] Elgorashi Ee, Taylor Jl, Maes A, Van Staden J, De Kimpe N, Verschaeve L, Toxicology Letters. 2003.143,195–207.
[76] Kamau Ln,Mbaabu Pm,Mbaria Jm,Gathumbi Pk,Kiama Sg.Tang.2016; 6, 21e
[77] Muhammad By, Alhassan Aj, Jaafura Ij.International Journal Of Biochemistry Research And Review.2015;7, 139–147.
[78] Ilavarasan R, Mallika M, Venkataraman S.Toxicology Mechanisms And Methods.2011;21, 246–250.
[79] Pour Bm, Latha Ly, Sasidharan S.Molecules.2011.16, 3663–3674.
[80] Araldi R P, Dos Santos Mo, Barbon Ff,Manjerona B A,Meirelles Br, De Oliva Neto P, Da Silva P I, Dos Santos L, Camargo Icc, De Souza Eb.Biomedicine & Pharmacotherapy.2018;98, 873–885.
[81] Zengin G , Menghini L, Di Sotto A, Mancinelli R,Sisto F, Carradori S, Cesa S , Fraschetti C, Filippi A , Angiolella L , Locatelli M , Mannina L ,Ingallina C,Puca V, D'antonio M, Grande R. Molecules.2018;23,3266.
[82] Leonti M. J Ethnopharmacol. 2011;134(3):542–55.
[83] Bellik Y, Boukraâ L, Alzahrani Ha, Bakhotmah Ba, Abdellah F, Hammoudi Sm, Iguer-Ouada M.Molecules. 2012;18(1):322–53.
[84] Van Wyk B, Van Oudtshoorn B, Gericke N.1997; Briza, Pretoria.
[85] Awan Mr, Jamal Z, Khan A. Scitech Dev. 2013;32(4):308–18.
[86] Naidoo D, Van Vuuren S F, Van Zyl Rl, Dewet H.Journal Of Ethnopharmacology.2013; 149, 656–667.
[87] Ndubani P, Höjer B. Journal Of Ethnopharmacology.1999;67,15–25.
[88] Van Vuuren S, Viljoen A. Planta Medica.2011;77,1168–1182.
[89] Trotter Rt, Logan Mh.Redgrave Publisher, Bedford Hills.1986; 91–112.
[90] Ellof Jn. Journal Of Ethnopharmacology. 1998; 60, 1–8.
[91] Ali-Shtayeh Ms, Yaniv Z, Mahajna J. J Ethnopharmacol. 2000;73(1):221–32.
[92] Lall N, Kishore N. J Ethnopharmacol. 2014;153(1):61–84.
[93] Sawadogo W R, Schumacher M, Teiten M, Dicato M, Diederich M.Biochemical Pharmacology. 2012; 84,1225–1240.
[94] Galicia He, Contreras Aa, Santamaria Al,Ramos Rr, Miranda Caa, Vega Glm,Saenz Fjl, Aguilar Afj. Proc. West. Pharmacol. Soc. 2002; 45: 118-124.