



RESEARCH ARTICLE

PROXIMATE ANALYSIS OF SOME EXTRACTS USED IN ALTERNATIVE MEDICINE

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ABSTRACT

Investigation into proximate content of some extracts (*Aloe vera*, *Ganoderma*, Earthworm and snail) used for alternative medicine was conducted. Proximate analysis showed significant differences ($P < 0.05$) among the extract samples. The moisture content, protein, fat, fibre, ash and carbohydrate contents from the extract samples were in the range of 7.03%-8.17%, 34.63%-67.47%, 2.17%-5.53%, 0.00%-7.63%, 7.33%-12.30% and 7.40%-41.73% respectively. The highest moisture content was recorded in the *Ganoderma* extract while the lowest moisture content value was recorded in the earthworm extract. The protein content in the earthworm extract was the highest while that of *Aloe vera* was the lowest. Earthworm extract had the highest fat value while the extracts of *Ganoderma* and *Aloe vera* had the lowest value. Earthworm extract had the highest ash value and *Aloe vera* extract had the lowest value. The highest fibre content was recorded in *Ganoderma* extract while no fibre was detected in the snail water. *Aloe vera* extract showed the highest level of carbohydrate while the lowest carbohydrate content was recorded in the earthworm extract. The results of the proximate analyses of the extracts showed that they are highly nutritious and can be used as remedies for various nutritional deficiencies and diseases. However, their usefulness in different cases would depend on their compositions.

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INTRODUCTION

Nowadays more and more people choose to be treated by methods that are not based on Western systematic techniques that are the knowledge and practice of medicine which is usual in the West. These methods are known as "Alternative medicine. Alternative Medicine is defined as medicine that encompasses any healing practice "that does not fall within the realm of conventional medicine." Commonly cited examples include naturopathy, chiropractic, herbalism, traditional Chinese medicine, Ayurveda, meditation, yoga, biofeedback, hypnosis, homeopathy, acupuncture, and diet-based therapies, in addition to a range of other practices. According to the World Health Organization, nearly 80 percent of the world's population depends for its primary health care needs on medicines derived from plants and animals (EBAA, 2007). Of the 252 essential chemicals that have been selected by the World Health Organization, 11.1% come from plants, and

8.7% from animals (Marques, 1997). Animals have been used as medicinal resources for the treatment and relieve of a myriad of illnesses and diseases in practically every human culture. Although considered by many as superstition, the pertinence of traditional medicine based on animals cannot be denied since they have been methodically tested by pharmaceutical companies as sources of drugs to the modern medical science (Launet, 1993). The annual global trade in animal-based medicinal products accounts for billions of dollars per year (Kunin and Lawton, 1996). In India nearly 15-20 percent of the Ayurvedic medicine is based on animal-derived substances (Unnikrishnan, 1998). Indeed, animals are therapeutic arsenals that have been playing significant roles in the healing processes, magic rituals, and religious practices of peoples from the five continents (Costa-Neto and Marques, 2000). Purified extracts of heparin were obtained from mammals and were shown to be effective and caused no ill effects in dogs, rabbits, guinea pigs and mice, and subsequently in human patients (Murray et al., 1937). Heparin is used as an anticoagulant for surgical procedures. Oily fish, like cod, herring, salmon, and turbot, have a great medicinal value to human beings due to a polyunsaturated compound

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known as Omega-3. This substance helps the prevention of arthritis (Adeodato, 1997). In many Asian countries a bear's bladder is considered very powerful against digestive illnesses (Balzar, 1992). There are about 35,000 species of higher plants that are used for medicinal purposes (Boroomand and Grouh, 2012). Some of these species of plants contain nutrients that have therapeutic properties and are nutritionally important because of their high contents of minerals, essential fatty acids, fibres and proteins (Turan *et al.*, 2003; Jabeen *et al.*, 2010; Ghani *et al.*, 2012). Botanical immune-drugs from traditional medicine can provide newer opportunities to bio-respect diverse and synergistic chemical moieties, which in combination might act on multiple targets and improve the therapeutic spectrum (Patwardhan and Guatam, 2005). The use of medicinal plants as traditional medicines is well known in rural areas of many developing countries (Sandhu and Heinrich, 2005). The medicinal value of plants lies in some chemical substances that produce definite physiological actions in human body. The most important of these bioactive compounds of plants are alkaloids, flavonoids, tannins and phenolic compounds (Edeoga *et al.*, 2005). Natural products extracts of therapeutic relevance are of paramount importance as reservoirs of structural and chemical diversity. A recent review on national pharmacopoeias from several countries reveals at least 120 distinct chemical substances from different plants that have utility as lifesaving drugs (Goswami *et al.*, 2002). There is the need to explore and unearthed the untapped and hidden wealth of medicinal virtues in fauna and flora to cure diseases (Patwardhan *et al.*, 2005; Goswami *et al.*, 2002). Natural products are excellent sources of lead compounds in the search for new medications for some kinds of clinical disorders. Natural products, such as plants extract, either as pure compounds or as standardized extracts, provide unlimited opportunities for new drug discoveries because of the unmatched availability of chemical diversity (Cosa *et al.*, 2006). The renewed interest in natural therapeutic methods and the use of natural product treatments has led to a steadily growing interest in medicinal plants and the classical methods of plant extract preparations (Newman and Cragg, 2007). However, systematic exploitation of these natural resources for their human health benefits has not been carried out to a significant degree.

The advantages of using alternative medicine are being recognized more and more now-a-days by health care professionals. One of the major advantages or advances is the approach to the whole body healing and treatment of the underlying causes of diseases and conditions. This approach of looking at the entire person as compared to just symptoms can significantly improve an individual's overall health and quality of life. Treating the body naturally allows it to heal on its own while significantly reducing the possibility of side effects. In addition, it's believed that the widespread overuse of conventional medicine has caused many of these medicines to lose out on their effectiveness. Not only are the vast majority of alternative therapies known to be safe and effective as well but they also offer individuals a wide variety of healthy therapy options that simply are not available through conventional treatment. Herbal treatments are a lot more convenient as they can be purchased over the counter from any health and food store without the need of a prescription.

Alternative way of treatment has verified its efficiency and is methodically founded, but unfortunately has its little disadvantages and a need to be scientific base. Alternative therapies cannot cure sudden illness or injury. As there are no diagnostic tests or surgery in this form of treatment, it cannot treat a broken leg or heal a heart attack. Also, not knowing the exact reasons for certain symptoms can lead to a wrong diagnosis. Unlike standard medications, alternative therapies have no specific instructions regarding dosage or frequency of treatment. Despite these limitations, the future looks bright for the continued growth of alternative medicine in the world. The present research is designed to determine the proximate analysis of some extracts used for alternative medicinal purposes.

***Aloe vera* extracts:** Historical use of various *Aloe* species by human has been well documented, though the species of *Aloe* used and their clinical effectiveness remain not fully understood (Reynolds, 2003). Of the 300 species of *Aloe*, only few were used traditionally as herbal medicine and some species, in particular *Aloe vera* was used in alternative medicines and in home first aid (Maenthaisong *et al.*, 2007). Both the translucent inner pulp and the resinous yellow exudates from wounding the *Aloe* plant are used externally to relieve skin discomforts (Maenthaisong *et al.*, 2007).

***Earthworm*:** In China, research on medicinal uses of earthworms has a history of nearly 4,000 years (Zhang *et al.* 1992). It has been discovered in China, Japan, Canada and other places that the isolation, identification and synthesis of some bioactive compounds from earthworms could have therapeutic effects or application in some industries (Tanaka and Nataka, 1974, Mihara *et al.*, 1983, 1990, 1991). Some of these compounds were found to have enzymes exhibiting anti blood clotting effects (Nakajimi *et al.*, 2003, Cho, 2004). Oral administration of these enzymes was found to be effective in treating thrombotic disease, arthritis, diabetes mellitus, pulmonary heart diseases, schizophrenia, epilepsy, mumps, exsema, chronic lumbago, vertigo, digestive ulcer and others (Sumi *et al.*, 1980, Toki *et al.*, 1985, Sumi *et al.*, 1987, 1990; Cheng and Sun, 2000). According to traditional Chinese medicine, earthworms possess antipyretic, antispasmodic, diuretic, antihypertensive, antiallergic, antiasthmatic, detoxic, and spermatocidal effects. Earthworm medicines are prescribed to treat over 80 diseases (e.g., asthma, hypertension, mumps, ulcer, epilepsy, cancer, etc.). Earthworm extract is worth further study especially as a new spermatocide (Zhang *et al.*, 1992).

***Snail serum* extract:** For centuries snails have been used both as food and as treatment for a variety of medical conditions. Snail mucus consists of a complex mix of proteoglycans, glycosaminoglycans, glycoprotein enzymes, hyaluronic acid, copper peptides, antimicrobial peptides, and metal ions (Smith *et al.*, 2009). The wound healing property of snail mucus has been reported (Adikwu and Ikejiuba, 2005). Snail fluid extract produced by the giant land snail has extraordinary skin healing properties. It is packed with allantoin, collagen, alastin, glyctic acid and natural antibiotics, which generate and protect skin cells. Also, high purity snail filtrate is effective in cases of various veins, psoriasis, abscesses, prevention of

stretch marks, cellulitis, wrinkles, scarring burns including sun burns, mouth ulcers, nappy rash, acne results appear after two weeks (Brieva *et al.*, 2008). Eating snails was prescribed for individuals suffering from vertigo, fainting fits, and fits of madness. In addition, snails have been used for various purposes. They are swallowed whole as a treatment for gastritis or stomach ulcer (Quave *et al.*, 2008); syrup from snails is used for the treatment of ulcers, bronchitis, asthma (Cremati, 2007); snail slime products are used to treat acne, reduce pigmentation and scarring and combat wrinkles (Reporter, 2012); snail mucus contains peptides such as mucin with antibacterial activity against both Gram positive and Gram negative bacteria and stimulate many elements of immune systems, including barrier repair and inflammatory cell recruitment (Kubota, *et al.*, 1985).

***Ganoderma lucidum* extracts:** *Ganoderma lucidum* has been used as medicinal mushroom in traditional Chinese medicine (TCM) for more than 2,000 years (Kenneth, 1990), thus making it one of the oldest mushrooms known to have been used medicinally. Its ultimate health benefits and absence of side effects (Engelbrecht and Volks, 2005). In Chinese for klore, *Ganoderma* have been regarded as a panacea for all types of diseases (Lai *et al.*, 2004, Oluba *et al.*, 2010). This is probably due to its demonstrated efficiency as a popular remedy to treat several disease conditions, namely chronic hepatitis, arthritis, hypertension, diabetes, debility due to prolonged illness etc. (Lai *et al.*, 2004; Oluba *et al.*, 2010). Polysaccharides and triterpenes of *Ganoderma* are the major sources of its pharmacological active constituents (Sheena *et al.*, 2005; Smina *et al.*, 2011). It possesses antidiabetic, antilipidemic and cardioprotective activities (Oluba *et al.*, 2010). In addition, it has also been reported to have antiviral activity with specific action on *HSV-1* and *HSV-2*, *Influenza virus*, *Vesicular stomatitis* and *HIV type 1* or a "fix it all" remedy for maladies (Lindequist *et al.*, 2005; Paterson, 2006; Liu *et al.*, 2006; Chinese Herbal Medicine, 2004; Wang and Ng, 2006; Moradelli *et al.*, 2006; El-Mekkawy *et al.*, 1998; Engelbrecht and Volks, 2005).

MATERIALS AND METHODS

Samples of earthworm were procured from riverside of Okitipupa, Ondo State. They were washed with water and transported in a clean plastic bucket with moist sand to the laboratory for processing. The extraction of the samples was carried out according to the method described by Ang Lopez and Realm (2005). Samples of succulent leaves of *Aloe vera* plant were procured from the neighbourhood, washed with distilled water and taken to the laboratory for processing. Extraction of *Aloe vera* juice was done according to the method described by Wu *et al.* (2006). Samples of *Ganoderma lucidum* were obtained from a farmland in Owo Local Government Area, Ondo State, Nigeria. Aqueous extraction was carried out on the samples according to the method of Oluba *et al.*, (2010). Samples of matured giant land snails were obtained from Oje market, Ibadan, Oyo State and were transported to the laboratory for processing. The samples were thoroughly cleansed with distilled water. The bluish supernatant after the shell is carefully removed and the resultant fluid

from the snails was centrifuged at 500 rpm for 15 minutes. Proximate analysis was carried out on each of the four extracts-the extracts from earthworm, *Aloe vera*, *Ganoderma lucidum*, and snail (*Archachatina*) and the results are shown in tables below.

Statistical analysis

All assays were carried out in triplicate, and the means and standard error of means (SEM) were determined using SPSS version 20. Analysis of variance was performed to determine significant differences between the paired samples. Differences in paired samples performance for the nutritional and chemical compositions were tested by the Student's t-test. <0.05 implies significance.

RESULTS

The results of proximate compositions of the extracts are shown in Table 1. The moisture content ranged from 7.03% to 8.17%. The highest moisture content (8.17%) was recorded in the *Ganoderma* extract while the lowest moisture content value was recorded in the earthworm extract. The protein content ranged from 34.63% to 67.47%. The protein content (67.47%) in the earthworm extract was the highest while that of *Aloe vera* (34.63%) was the lowest. Fat content ranged from 2.17% to 5.53% with earthworm extract having the highest value and the extracts of *Ganoderma* and *Aloe vera* having the lowest value. Ash content ranged from 7.33% to 12.3% with earthworm extract having the highest value and *Aloe vera* extract having the lowest value. Crude fibre content ranged from 0.00% to 7.63%. The highest fibre content (7.63%) was recorded in *Ganoderma* extract while no fibre content was detected in the snail water. Carbohydrate content ranged from 7.40% to 41.73%. *Aloe vera* extract showed the highest level of carbohydrate (41.73%) while the lowest carbohydrate content was recorded in the earthworm extract. Figure 1 shows the trends of the proximate analyses of the extracts. Table 2 shows the paired samples test of proximate analyses of the extracts. There was a significant difference between the moisture content values of snail water and *Ganoderma* extract; between the moisture content values of *Ganoderma* extract and earthworm extract and between moisture content values of *Aloe vera* extract and earthworm extract. Significant differences were recorded in the protein content values, the ash content values, the crude fibre values amongst the following extracts: snail water and *Ganoderma* extract; snail water and *Aloe vera* extract; snail water and earthworm extract; *Ganoderma* extract and *Aloe vera* extract; *Ganoderma* extract and earthworm extract and between *Aloe vera* and earthworm extract. In the fat content values of the extracts, significant differences were seen between snail water and *Aloe vera* extract; snail water and earthworm extract; *Ganoderma* extract and earthworm extract and between *Aloe vera* and earthworm extract. There were significant differences between the carbohydrate values of the following extracts: snail water and *Aloe vera* extract; snail water and earthworm extract; *Ganoderma* extract and *Aloe vera* extract; *Ganoderma* extract and earthworm extract and between *Aloe vera* and earthworm extract.

Table 1. Proximate analysis of some extracts used in alternative medicine

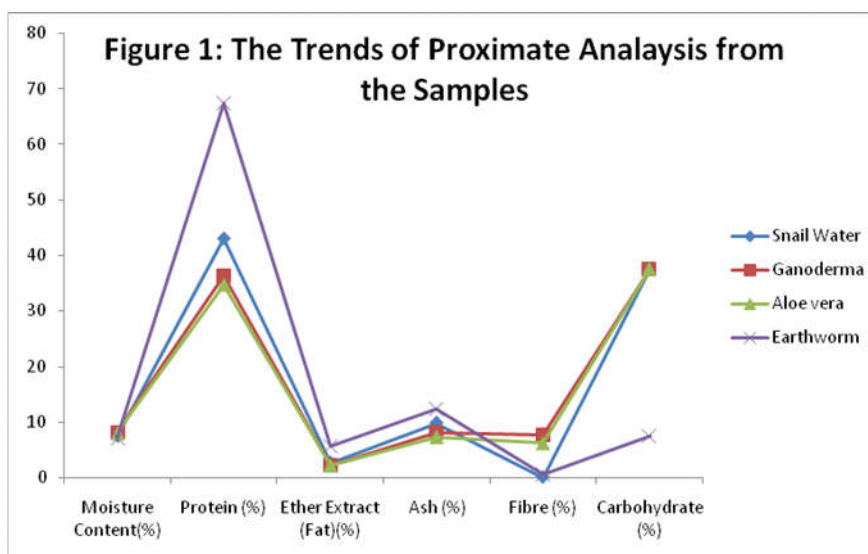
Parameter	Snail water	Ganoderma	Aloe vera	Earthworm
Moisture content (%)	7.40±0.10	8.17±0.09	7.97±0.09	7.03±0.09
Protein (%)	43.03±0.09	36.27±0.12	34.63±0.09	67.47±0.09
Ether (fat) %	2.63±0.07	2.17±0.09	2.17±0.07	5.53±0.09
Ash (%)	9.8±0.06	8.03±0.09	7.33±0.09	12.3±0.25
Fibre (%)	0.00	7.63±0.03	6.17±0.19	0.43±0.03
Carbohydrate (By difference) %	37.40±0.24	37.57±0.20	41.73±0.26	7.40±0.25

Values are means ±SEM (Standard error of means) of triplicate samples.

Table 2. Paired samples test of proximate analyses of some extracts used in alternative medicine

Parameter	Paired samples	Diff. Mean	Sig. (2-Tailed)
Moisture content (%)	snail_water- Ganoderma	-0.77±0.15	0.034
	snail_water- Aloe_vera	-0.57±0.15	0.060
	snail_water- Earthworm	0.37±0.19	0.187
	Ganoderma- Aloe_vera	-----	-----
	Ganoderma- Earthworm	1.13±0.09	0.006
	Aloe_vera- Earthworm	0.93±0.09	0.009
Protein (%)	snail_water- Ganoderma	6.77±0.07	0.000
	snail_water- Aloe_vera	8.40±0.17	0.000
	snail_water- Earthworm	-24.43±0.13	0.000
	Ganoderma- Aloe_vera	1.63±0.19	0.013
	Ganoderma- Earthworm	-31.20±0.12	0.000
	Aloe_vera- Earthworm	-32.83±0.09	0.000
Ether extract (fat) %	snail_water- Ganoderma	0.47±0.15	0.085
	snail_water- Aloe_vera	0.47±0.03	0.005
	snail_water- Earthworm	-2.90±0.15	0.003
	Ganoderma- Aloe_vera	0.00±0.12	1.000
	Ganoderma- Earthworm	-3.37±0.09	0.001
	Aloe_vera- Earthworm	-3.37±.12	0.001
Ash content (%)	snail_water- Ganoderma	1.77±0.13	0.006
	snail_water- Aloe_vera	2.47±.07	0.001
	snail_water- Earthworm	-2.50±0.26	0.011
	Ganoderma- Aloe_vera	0.70±0.12	0.026
	Ganoderma- Earthworm	-4.27±0.32	0.006
	Aloe_vera- Earthworm	-4.97±0.33	0.004
Crude fibre (%)	snail_water- Ganoderma	-7.63±0.03	0.000
	snail_water- Aloe_vera	-6.17±0.32	0.001
	snail_water- Earthworm	-0.43±0.19	0.001
	Ganoderma- Aloe_vera	1.47±0.17	0.013
	Ganoderma- Earthworm	7.20±0.06	0.000
	Aloe_vera- Earthworm	5.73±0.22	0.001
Carbohydrate (by difference) %	snail_water- Ganoderma	-0.10±0.44	0.840
	snail_water- Aloe_vera	-4.27±0.20	0.002
	snail_water- Earthworm	30.07±0.44	0.000
	Ganoderma- Aloe_vera	-4.17±0.38	0.008
	Ganoderma- Earthworm	30.17±0.13	0.000
	Aloe_vera- Earthworm	34.33±0.33	0.000

Significant difference (P < 0.05)



DISCUSSION

The moisture content can be used as a pointer to the rate at which deterioration occurs in the samples. The propensity of microorganisms to grow in foods depends on their water content. High moisture content would encourage microbial growth and so deterioration and low moisture content reduces to minimum the conditions that allow for spoilage organisms and chemical activities. For this reason many foods are dried below some critical moisture content. Furthermore, the texture, taste, appearance and stability of foods depend on the amount of water they contain and the knowledge of the moisture content is often necessary to predict the behavior of foods during processing. Kaneko (1976) reported that a lot of proteolytic, lipolytic deterioration and microbial proliferation are encouraged at moisture levels of 15% and above. The moisture contents of the extracts will not encourage the growth of microorganisms on them. However, the moisture content of earthworm extract showed that it has the highest storage potential and better shelf life. Plahar *et al.* (1991) reported that fat content of 15-33% would cause rancidity problems in storage fish. The relative low value of fat content in the extracts is an indication of the level of resistance of the extracts to rancidity. In addition, low crude fat recorded from the extracts in comparison to protein suggests that they could be recommended as good source of food supplement for patient with cardiac problems or at risk with lipid induced disorders. The relatively low crude fibre content in snail water and earthworm extract in comparison to *Ganoderma* and *Aloe vera* is an indication of the difference between plant and animal tissues. The crude fibre content indicates the amount of cell walls in the feed. Thus, the energy content of snail water and earthworm extract is higher than the energy content of *Ganoderma* extract and *Aloe vera* extract because crude fibre is considered as indigestible. However, *Ganoderma* extract and *Aloe vera* extract because of the higher level of crude fibre will have higher preventive and treatment value against constipation; hemorrhoids and diverticulosis and also help to decrease blood cholesterol levels. The relatively high carbohydrate and protein content in the extracts is a proof that the extracts are highly nutritious and good for human consumption. However, the higher protein contents found in snail water and earthworm extract than that of *Ganoderma* and *Aloe vera* clearly showed that higher protein values are found in animal tissues than in plant tissues. So, animal extracts would be better sources of protein than plant extracts and would stand a better chance to correct protein deficiencies and the associated diseases and sicknesses. Conversely, the relative higher values of carbohydrates in *Aloe vera* and *Ganoderma* extracts than in earthworm extract and snail water shows that there is higher carbohydrate content in plant tissues than animal tissue and so plant extracts would be better sources of carbohydrates than animal sources.

Conclusion

The proximate analyses of *Ganoderma*, *Aloe vera*, earthworm extracts and snail water showed that they are highly nutritious and can be used as remedies for various nutritional deficiencies and diseases. However, their usefulness in different cases would depend on their compositions.

REFERENCES

- Adeodato, S. 1997. Os santos remédios do mar. Globo Ciência, Abril: 20–25.
- Adikwu, M. U., Ikejiuba, C. C. 2005. Some physiochemical and wound healing properties of snail *Mucin*. Bolletino Chimico Farmaceutico. 144: 1- 8.
- Ang Lopez, J. and Realm, A. 2005. Indigenous uses of the native *L. rubellus* extract and its fatty acid profile. Paper presented at International Symposium-workshop on vermin-technology for the developing countries (ISWVT) at Los Baños, Laguna, Phils. Philippine Fisheries Association, Inc. 135p.
- Balzar J. 1992. Uma cultura antiecológica. *Jornal do Brasil*, 22 April.
- Boroomand, N. and Grouh, M. S. H. 2012. Macroelements nutrition (NPK) of medicinal plants: A review. *J. Med. Plants Res.*, 6(12): 2249–2255.
- Brieva, A., Philips, N., Tejedor, R., Guerrero, A., Pivel, J. P. and Alonso-Lebrero, J. L. 2008. Molecular basis for the regenerative properties of a secretion of the mollusk *Cryptomphalus aspersa*. *Skin Pharmacol Physiol.*, 21(1): 15-22.
- Cheng, W. and Sun, Z. L. 2000. Pharmaceutical values and uses of earthworms, vermilleum abstracts, Flower-field Enterprises, Kalamazoo.
- Chinese Herbal Medicine 2004. *Materia Medica.*, Third edition, (By Dan Bensky, Steven Clavey, Erich Stones and Andrew Gamble) In *Wikipedia*, 2011.
- Cho, I. H., Choi, E. S., Lim, G. H. and Lee, H. H. 2004. Purification and characterization of six fibrinolytic serin-proteases from earthworm, *Lumbricus rebus*. *J. Biochem. Mol. Bio.*, 37 (2): 199-205.
- Cosa, P., Vlietinck, A.J., Berghe, D.V., Maes, L. 2006. Anti-infective potential of natural products: How to develop a stronger in vitro 'proof-of-concept'. *J. Ethnopharmacol.*, 106: 290-302.
- Costa-Neto EM and Oliveira MVM. 2000. Cockroach is good for asthma: zootherapeutic practices in Northeastern Brazil. *Hum Ecol Rev.*, 7: 41–51.
- Cremati J. 2007. Sensitized Slug Slime Recipe. University of Saskatchewan. Available from URL: <http://www.usask.ca/lists/alt-photo-process-1/200712/msg00196.html>.
- EBAA 2007. Encyclopedia Britannica advocacy for animals. *Traditional Chinese medicine and endangered animals*.
- Edeoga, H. O. and Eriata, D. O. 2001. Alkaloids, tannins and saponins Content of Some medicinal plants. *Journal of Medical and Aromatic Plant Science*, 23: 344-349.
- El-Mekawy, S. Meselhy, M. R. Nakamura, N. Tezuka, Y. Hattori, M. Kakiuchi, N. Shimotohno, N. Kawahata, T and Otake, I. 1998. Anti-HIV-1 and anti-HIV-1- protease substances from *Ganoderma lucidum*. *Phytochemistry* 49(6): 1651-1657.
- Engelbrecht, K. and Volks. T. 2005. *Ganoderma lucidum*, *Reishi or Lingzhi*, A fungus used in Oriental medicine. *TomVolksFungi.net*, 1-4.
- Ghani, A., Ali, Z., Ishtiaq, M., Maqbool, M. and Parveen, S. 2012. Estimation of macro and micro nutrients in some important medicinal plants of Soon Valley, District Khushab, Pakistan. *Afr. J. Biotechnol.*, 11(78): 14386–14391.

- Goswami, A., Barooch, P. K., Sandhu, J. S. 2002. Prospect of herbal drugs in the age of globalization-Indian senerio. *J. Sci. Ind. Res.*, 61: 423-443
- Gupta, M. P., Solis, P. N., Calderon, A. I., Guionneau-Sinclair, F., Correa, M., Galdames, C., Guerra, C., Espinosa, A., Alvenda, G. I., Robles, G. and Ocampo, R. 2005. Medical ethnobotany of the Teribes of Bocas del Toro, Panama. *J. Ethnopharmacol.*, 96:389-401.
- Jabeen, S., Shah, M. T., Khan, S. and Hayat, M. Q. 2010. Determination of major and trace elements in ten important folk therapeutic plants of Haripur basin, Pakistan. *J. Med. Plant Res.*, 4(7): 559-566.
- Kenneth, J. 1990. Reishi, ancient herb for modern times, *Sylvan pres.*, 6.
- Kubota, Y., Watanabe, Y., Otsuka, H., Tamiya, T., Tsuchiya, T. and Matsumoto, J. J. 1985. Purification and characterization of an antibacterial factor from snail mucus. *Comp Biochem Physiol.*, 82(2).
- Kunin, W. E. and Lawton, J. H. 1996. Does biodiversity matter? Evaluating the case for conserving species. In: Gaston K. J. (Ed), *Biodiversity: a biology of numbers and differences*, Oxford: Blackwell Science, p. 283-308.
- Lai, T., Gao, Y., Zhou, S. 2004. Global marketing of medicinal lingzhi mushroom *Ganoderma lucidum* (W.Curt.:Fr.) Lloyd (Aphyllphoromycetidae) Products and Safety Concerns. *Int. J. Med. Mushr.*, 6: 189-194.
- Launet, E. 1993. Dans les fôrets, à la recherche des médicaments de demain. *Science et Vie* 904: 86-91.
- Lindequist, U., Niedermeyer, T. H. J. and Julich, W. D. 2005. The pharmacological potentials mushroom. *Evidence Based Complementary and Alternative Medicine*, 2(3):285-299.
- Liu, J., Kurashiki, K. Shimuzu, K. and Kondo, R. 2006. Structure activity relationship for inhibition of 5 alpha-reductase by Triterpenoids isolated from *Ganoderma lucidum*. *Biorg.med.chem* 14(24): 8654-8660.
- Maenthaisong, R., Chaiyakunapruk, N., Niruntrapon, Kongkaew, C. 2007. The efficacy of *Aloe vera* used for burn wound healing: a systematic review. *Burns*, 33(6): 713-718.
- Marques, J. G. W. 1997. Fauna medicinal: recurso do ambiente ou ameaça à biodiversidade? *Mutum* 1: 4.
- Mihara, H., Sumi, H., Akazawa, K., Yoneta, T., Mizumoto, H. 1983. Fibrinolytic enzyme extracted from the earthworm. *Thromb. Haemostas.*, 50: 258.
- Mihara, H., Sumi, H., Mizumoto, H., Seiki, M., Ikeda, R., Maruyama, M. 1991. A novel fibrinolytic enzyme extracted from the earthworm *Lumbricus rubellus*. *Jpn. J. Physiol.*, 41: 461-472.
- Mihara, H., Sumi, H., Mizumoto, H., Yoneta, T., Ikeda, R., Maruyama, M. 1990. Oral administration of earthworm power as a possible thrombolytic therapy. In *Recent Advances in Thrombosis and Fibrinolysis*. Academic Press, New York. Pp 287-298.
- Moradelli, M. F. Mostafavi, H. Hajaroude, G. A. Tehrani, A. S. Abbasi, M. Ghods, S. 2006. Investigation of potential antibacterial properties of methanolic extract from fungus *Ganoderma applanatum*. *Chemotherapy*, 52(5):241-244.
- Murray, D., Jacques, M., Perrett, T. and Best, C. 1937. *Surgery* 2, 163-187.
- Nakajimi, N., Mishara, H. and Sumi, H. 2003. Characterization of potent fibrinolytic enzymes in earthworm, *Lumbricus rubellus*. *Biosci. Biotechnol.*, 57 (10): 1726-1730.
- Newman, D. J., and Cragg, G. M. 2007. Natural products as sources of new drugs over the last 25 years. *J. Nat. Prod.*, 70:461-477.
- Oluba, M. O., Onyeneke, E. C., Ojieh, G. C., Idonije, B. O. and Ojiezeh, T. I. 2010. Hepatoprotective protectial of aqueous extract of *Ganoderma lucidum* against carbon tetrachloride intoxication in rats. *Der Pharmacia Letter*, 2(4): 432-439.
- Paterson, R. R. 2006. "Ganoderma": a therapeutic fungal biofactory, *Phytochemistry*, 68(15).1985-2001.
- Patwardhan, B., Warude, D., Pushpangadan, P., and Bhatt, N., 2005. Ayurveda and traditional Chinese medicine: A comparative overview. *Evid. Based Complement Alternative Med.*, 2 (4): 465-473.
- Quave, C. L., Pieroni, A., Bennett, B. C. 2008. Dermatological remedies in the traditional pharmacopoeia of Vulture-Alto Brandano, inland southern Italy. *Ethnobiol Ethnomed.*, 4.
- Reporter, D. M. 2012. Snail slime hailed latest beauty wonder product, promising to 'clear acne, reduce scarring and beat wrinkles'. Daily Mail 2012; Available from URL: <http://www.dailymail.co.uk/femail/article-2216457/Snail-slime-hailed-latest-beauty-wonder-product-promising-clear-acne-reduce-scarring-beat-wrinkles.html>.
- Reynolds, T. 2003. *Aloe* chemistry. In *Aloes The Genus Aloe*; Reynolds, T. 2004 ed. CRC Press: Boca Raton. 74pp.
- Sandhu, D. S. and Heinrich, M. 2005. The use of health foods, spices and other botanicals in the Sikh community in London. *Phytotherapy Res.* 19:633-42.
- Sheena, N., Lakshmi, B. and Janardhanan, K. K. 2005. Therapeutic potential of *Ganoderma lucidum* (Fr.) P. Karst. *Natural product Radiance*, 4 (5): 382-386.
- Smina, T. P., Matthew, J., Janardhanan, K. K. and Devasagayam, T. P. 2011. Antioxidant activity and toxicity profile of total triterpenes isolated from *Ganoderma lucidum* (Fr) P. Karst occurring in South India. *Environ. Toxicol. Pharmacol.*, 32 (3): 438-446.
- Smith, A. M., Robison, T. M., Salt, M. D., Hamilton, K. S., Silvia, B. E. and Blasiak, R. 2009. Robust cross-links in molluscan adhesive gels: testing for contributions from hydrophobic and electrostatic interactions. *Comp Biochem Physiol B Biochem Mol Biol.*, 152(2).
- SPSS (Statistical package for Social Sciences) 1999. Computer Program, MS for Windows. *SPSS 10 for Windows*, Chicago, Illinois, USA.
- Sumi, H., Hamadu, H., Nakanisho, K., Hiratani, H. 1990. Enhancement of the fibrinolytic activity in plasma by oral administration of nattokinase. *Acta. Haematol.*, 84:139 - 143.
- Sumi, H., Hamadu, H., Tsushima, H., Mihara, H., Muraki, H. 1987. A novel fibrinolytic enzyme (nattokinase) in the vegetable cheese Natto, atypical and popular soybean food of the Japanese diet. *Experientia.*, 43:1110 -1111.
- Sumi, H., Toki, N., Sasaki, K., Robbins, K. C. 1980. Oral administration of Urokinase. *Thromb. Rse.*, 20: 711-714.
- Tanaka, B., Nakata, S. 1974. Studies of antipyretic components in the Japanese earthworm. *Tokyo Igaku Zasshi.*, 29: 67-97.

- Toki, N., Sumi, H., Sasaki, K., Boreisha, T., Robbins, K. C. 1985. Transport of urokinase across the intestinal tract of normarmal humans subjects with stimulation of synthesis and/or release of urokinase-type proteins. *J. Clin. Invest.*, 75: 1212-1220.
- Turan, M., Kordali, S., Zengin, H., Dursun, A. and Sezen, Y. 2003. Macro and micro-mineral content of some wild edible vegetable leaves consumed in Eastern Anatolia, *Acta Agri. Scand., Sect. B - Soil Plant Sci.*, 53(3): 129–137.
- Unnikrishnan, P. M. 1998. Animals in Ayurveda. *Amruth* 1(Supl): 1–15.
- Wang, H and Ng, T.B. 2006. “Ganodermin”, an anti-fungal protein from fruiting bodies of the mushroom, *Ganoderma lucidum*. *Peptides*, 27 (1): 27-30.
- Wu, J. H., Xu, C., Shan, C. Y., Tan, R. X. 2006. Antioxidant properties and PC12 cell protective effects of APS-1, a polysaccharide from *Aloe vera vera* var. *Chinensis*. *Life Sci.*, 78: 622–630.
- Zhang, F. X., Guo, B. and Wang, H. Y. 1992. The spermatocidal effects of earthworm extract and its effective constituents. *Soil Biol Biochem.*, 24: 1247–1251.
