



INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

“Evaluation Of Polyherb Syrup Agnaist Various Bacteria”

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ABSTRACT :

Most of ine refers to use extract of fruit for medicinal purpose. Along with other dosage from herbal drugs also formulated inform of syruMost of herbal syrup was originally derived from plast herbal medicps today syrup is used for treatment of many ailments and to overcome symptoms of diseases. The extraction of Fenugreek, turmeric & ginger is added into simple syrup. It is added as antibacterial agents. To inhibit the growth of bacteria. & Sugar alcohol sugar is used as preservatives. The Result Formulation E.coli is more activity shown as compared to staphylococcus aurous. The Reformulation studies of formulations were within specifications. Also, the physiochemical properties of prepared syrup like colour, odour, pH, Taste were satisfactory. According to present study, prepared formulation exhibited antimicrobial against bacteria E. coli and Staphylococcus aureus with Maximum Activity at 40 micro litre Concentration in E coli And Minimum Activity was observed in Staphylococcus aurous.

Key words:

Herbal medicine, secondary metabolites , antimicrobial, antifungal, antibacterial, antiviral, antiparasites activity, polyherbal formulation .

Indroduction to Herbal Medicine:

Herbal medicine (HM) is the fulcrum of complementary and alternative medicine, which in recent times is increasingly gaining widespread popularity all over the world and gradually streaming toward integration into the mainstream healthcare systems. The use of HM cuts across gender, social and racial classes in both developing and developed countries of the world Due to the increasing popularity of HM, stakes in the world markets (local and international) are also rapidly increasing and the annual sale is rapidly approaching US \$62 billion. An important driver in this upsurge in patronage and use includes low cost, the wide acceptance due to its status of being a natural product with the acclaim of low toxicity, efficacy in certain challenging diseases, flexibility in its accessibility, preparation and use. HM includes preparations of biologically active natural products that consist largely of herbs or herbal materials, some recipes may contain materials such as fungal and bee products, as well as minerals (kaolin, bentonite), ash, shells, insects and animal parts, and are used for the maintenance of health and management of various diseases. the toxic effects that are elicited by HMs have been linked to the activities of the secondary metabolites.

1.Turmeric : The rhizomes of turmeric are obtained from the plant *Curcuma longa* belonging to the family Zingiberaceae, a spice commonly used in Indian and Middle Eastern cuisine, has been traditionally used in Ayurvedic and Chinese medicine to treat various respiratory problems, including coughs. Turmeric contains a compound called curcumin, which has anti-inflammatory and antioxidant properties that can help to reduce inflammation and boost immunity.

**Fig : 1.1**

2. Ginger : The rhizomes of ginger are obtained from the plant *Zingiber officinale* belonging to family Zingiberaceae. Ginger, a anti-aging drug, can be used as a natural remedy for coughs. Ginger contains several bioactive compounds, including gingerols and shogaols, which have anti-inflammatory and antimicrobial properties that can help to reduce inflammation and fight off infections that may be causing the cough.

**Fig : 1.2**

3. Fenugreek : Kasuri Methi is short, upright plant (related to spinach) with oval leaves. The entire plant has a strong, sweet aroma. The mature leaves have the bitter taste. Ground fenugreek (seeds) has a warm, yellowish-brown color with a strong curry-like taste. In powdered form, fenugreek is one of the main ingredients of curry powders. Fenugreek is used to add flavor to meat dishes. It is also considered as an aphrodisiac .

**Fig : 1.3**

Benefits Of Herbal Medicine :

Herbal medicines (HM) include herbs, herbal materials, herbal preparations and finished herbal products that contain as active ingredients parts of plants, or other plant materials, or combinations and are used especially for the prevention and treatment of diseases. In contemporary times, HM remains a major component of the primary healthcare in many rural African and Asian communities. It also constitutes an integral part of the culture of many societies of the world.

Many herbs and herbal recipes have a long traditional history of folk uses and claims of health benefits. Scientific research has shown that HMs contain complex chemical compounds that are responsible for the pharmacological activities, which corresponds to health benefits and/or toxicity they elicit. HMs have been used as prophylaxes for the passive maintenance of health as well as for radical treatment of varieties of mild to serious diseases. In contemporary times, HMs are prepared and used in different forms, which also affect their activity outcomes. The dosage form of herbal medicines varies widely depending on such factors as the type of disease to be treated, route of application, patient, culture and even philosophical backgrounds. In homes and traditional medicine clinics, HMs are prepared often from fresh or dried herbs which are commonly made into infusions, decoctions, poultices, powders to be poured into open wounds or incorporated into native beverages, puddings, and so on. Conventional commercial HMs products are commonly available as pills, capsules, tablets, powders/granules, creams, ointments, and so on. The presentation of HMs in pharmaceutical dosage forms is expected to enhance accurate dosing, esthetics as well as compliance by enticing usage. Safety and efficacy are another important factor overriding the use and commercialization of HMs. The quality of herbal products is essentially dependent on the safety and efficacy of the herbal material in relation to the intrinsic chemical components, type of contaminants as well as the production processing. The chemical compounds that are contained in herbal materials have shown a wide range of benefits in the management of various diseases including challenging diseases/conditions such as HIV/AIDS, cancer, sickle cell disease, malaria and other infectious diseases as well as noninfectious diseases such as diabetes, obesity, infertility, and so on.

Materials And Equipments :

The various selected plant materials, apparatus and chemicals of Merck were used for the determination and the preparation of formulations including the evaluation parameters.

Methodology:

Selection Of Plants:

1. Turmeric-It is collected from medicinal garden situated at Dr Vedprakash Patil Ayurvedic Medical College, Jalna
2. Fenugreek/Methi)-It is collected from medicinal garden situated at Dr. Vedprakash Patil Ayurvedic Medical College Jalna
3. Ginger -It is collected from medicinal garden situated at Dr. Vedprakash Patil Ayurvedic Medical College Jalna.

Selection of method

1. Decoction
 2. In-vitro microbial assay
- Selection of material

Plant

1. Turmeric
2. Fenugreek
3. Ginger

Apparatus

1. Extraction Apparatus.
2. Beaker
3. Stirrer

4. Funnel

5. Water Bath

Microbial Assay

1. Nutrient Agar As a Culture.

2. Bacterial Strains E.coli, Streptococcus aureus Sulphonamide As a Standard.

Extraction from Dried Turmeric using Decoction Method:

Dried Turmeric is crushed with the pestle and mortar, to provide greater surface area 5gm of crushed Turmeric is added to 80ml of water and boiled up to 40ml., and filtered.

Extraction from Fenugreek (Methi) using Decoction Method:

Fenugreek is 5gm is added to 80ml of water and boiled up to 40ml and filtered.

Extraction from Ginger using Decoction Method:

Ginger is crushed with the pestle and mortar, to provide greater surface area. 5gm of crushed Ginger is added to 80ml of water and boiled up to 40ml and filtered.

Preparation of Syrup & Formulation:



Fig : Simple Syrup

1. 66.7mg Sucrose was weighed and added to purified water.
2. Heat until sugar dissolved completely with occasional stirring.
3. Other additives like preservatives. Colouring agent, flavouring agents etc were added as per the formula shown in following table A.
4. Decoction of plant extract added to the prepared simple syrup as shown in the formula show in the table B.
5. Sufficient purified boiling water was added to the mixture to a final volume of 100ml

Extraction:

Preparation of liquid oral.

The liquid oral was prepared by liquid oral.

- i. 5gm of each herbal ingredient
 - ii. Each herb was mixed using 80ml of water.
 - iii. The material was boil carefully using water bath
 - iv. Boil until total volume become half
 - v. Liquid was cooled & filter

Need And Objectives :

1. Medicinal purposes: Syrups are often used as a convenient and palatable way to administer medication, especially Medicinal Pfor children or those who have difficulty swallowing pills or tablets.
2. Flavor Enhancement: Syrups are used to enhance the flavor of various food and beverage products, such as desserts, cocktails, and breakfast items.
3. Sweetening Agent: Syrups serve as a natural sweetening agent in recipes and beverages, offering an alternative to refined sugar.
4. Moisture Retention: Syrups are used in baking to retain moisture and improve the texture and shelf life of baked goods.
5. Nutritional Supplementation: Some syrups are formulated to provide nutritional supplementation, such as vitamin-infused syrups or herbal extracts.
6. Cough and Cold Relief: Herbal syrups are often used to relieve symptoms of coughs and colds, soothing sore throats and suppressing coughs.
7. Digestive Aid: Certain herbal syrups are formulated to aid digestion, alleviate digestive discomfort, and promote gut health.
8. Energy Boost: Syrups containing natural stimulants like caffeine or herbal extracts are used to provide a quick energy boost.
9. Hydration: Syrups mixed with water can serve as a refreshing and hydrating beverage, especially during hot weather or after physical activity.
10. Customization: Syrups offer the opportunity for customization, allowing individuals to tailor the flavor, sweetness, and nutritional content to their preferences and dietary needs.

Plan of Work :

. Research and Selection of Herbs:

Conduct thorough research on herbs known for their medicinal properties and compatibility with each other. Select herbs based on their intended therapeutic effects, such as immune support, respiratory health, or digestive aid.

Consider factors like taste, potency, and potential interactions between herbs.

. Ingredient Procurement:

Source high-quality herbs from reputable suppliers, ensuring they are organic and free from contaminants.

Obtain other ingredients such as sweeteners (honey, sugar, etc.), preservatives (if necessary), and flavorings (optional).

. Formulation Development :

Experiment with different combinations and ratios of herbs to achieve the desired therapeutic effects and taste profile.

Consider the solubility of herbs in water and their extraction methods to maximize their bioavailability.

Develop a recipe that balances the potency of the herbs with the palatability of the syrup.

. Extraction and Preparation:

Choose appropriate extraction methods such as decoction, infusion, or maceration to extract the active compounds from the herbs.

Prepare herbal extracts according to established techniques, ensuring consistency and quality.

. Synergy Testing:

Conduct compatibility tests to ensure that the selected herbs work synergistically and enhance each other's therapeutic effects.

Adjust the formulation as needed based on the results of synergy testing.

. Sweetening and Flavoring: Add sweeteners and flavorings to improve the taste and palatability of the syrup, while ensuring they do not compromise its medicinal properties.

Experiment with different sweeteners and flavorings to find the right balance.

. Quality Control:

Perform quality control tests to ensure the safety, potency, and purity of the syrup.

Test for microbial contamination, heavy metals, and other contaminants according to regulatory standards.

Ensure compliance with Good Manufacturing Practices (GMP) and other relevant regulations.

. Packaging and Labeling:

Choose appropriate packaging materials such as glass or plastic bottles that preserve the quality of the syrup.

Label the bottles with clear and informative labeling, including the list of ingredients, dosage instructions, and

any warnings or precautions.

. Stability Testing:

Conduct stability testing to assess the shelf life and stability of the syrup under various storage conditions (e.g., temperature, light exposure).

Monitor changes in color, flavor, aroma, and potency over time.

. Regulatory Compliance:

Ensure compliance with regulatory requirements for herbal products, including labeling, safety, and advertising standards.

Obtain any necessary certifications or approvals from regulatory authorities.

. Marketing and Distribution:

Develop marketing materials highlighting the benefits and unique selling points of the polyherb syrup.

Choose distribution channels such as online stores, pharmacies, health food stores, or direct sales.

. Launch and Feedback:

Launch the polyherb syrup in the market and gather feedback from customers.

Use feedback to make any necessary adjustments to the formulation, packaging, or marketing strategy.

. Continuous Improvement:

Stay updated on scientific research and developments in herbal medicine.

Continuously improve the formulation and manufacturing processes based on customer feedback and market trends.

By following this plan of work, you can develop a high-quality and effective polyherb syrup that meets the needs of your target market.

Literature Review :

1.Dejene Dida Bulbula et al :-

The objective of this comprehensive review assesses research analysing the nutraceutical qualities and bioactive compounds within turmeric that contribute to human nutrition, health promotion and chronic disease prevention. *Curcuma longa* L. (root and rhizome), commonly known as turmeric, is a plant of high medicinal and economic value globally, where it is mainly used as a spice and food supplement. The major active ingredients of turmeric include three curcuminoids, curcumin (diferuloylmethane, the primary constituent responsible for yellow colour of turmeric), desmethoxycurcumin, and bisdemethoxycurcumin. In addition, volatile oils (turmerone, atlantone, and zingiberene) also have pharmacological activity. In addition, carbohydrates, proteins, and resins are also present in turmeric. Turmeric has excellent antiinflammatory properties and is a superior antioxidant. The anticancer property of turmeric may be closely related to its anti-inflammatory property.

2.Susan J. Hewlings et al :-

Turmeric, a spice that has long been recognized for its medicinal properties, has received interest from both the medical/scientific world and from culinary enthusiasts, as it is the major source of the polyphenol curcumin. It aids in the management of oxidative and inflammatory conditions, metabolic syndrome, arthritis, anxiety, and hyperlipidaemia. It may also help in the management of exercise-induced inflammation and muscle soreness, thus enhancing recovery and performance in active people. In addition, a relatively low dose of the complex can provide health benefits for people that do not have diagnosed health conditions. Most of these benefits can be attributed to its antioxidant and anti-inflammatory effects. Ingesting curcumin by itself does not lead to the associated health benefits due to its poor bioavailability, which appears to be primarily due to poor absorption, rapid metabolism, and rapid elimination. There are several components that can increase bioavailability. For example, piperine is the major active component of black pepper and, when combined in a complex with curcumin, has been shown to increase bioavailability by 2000%. Curcumin combined with enhancing agents provides multiple health benefits.

3.N.M. KHANNA et al:-

Turmeric (*Curcuma longa*) is a well-known indigenous herbal medicine. Its major constituents, curcumin, various curcuminoids, curcuma oil-particularly dl-ar-turmerone - exhibit a wide range of biological activities, c.g., anti-bacterial, anti-inflammatory, hypolipidemic, hepatoprotective, lipoxygenase, cyclooxygenase, protease inhibitory effects, besides being effective active oxygen species scavengers and lipid peroxidase inhibitors.

4. Rakul Kumar Verma, et al :-

Turmeric is an herbaceous evergreen plant in the Zingiberaceae (ginger) family. Turmeric (*Curcuma longa*) is extensively used as a spice, food preservative and colouring material in India, China and South East Asia. Turmeric powder is best known as one of the main ingredients used to make the curry spice; it also gives ballpark mustard its bright yellow colour. Apart from its culinary uses, turmeric has been used widely in the traditional medicine all over the world. Curcumin (diferuloylmethane), the main yellow bioactive component of turmeric has been shown to have a wide spectrum of biological actions. These include its antiinflammatory, antioxidant, anticarcinogenic, antimutagenic, anticoagulant, antifertility, antidiabetic, antibacterial, antifungal, antiprotozoal, antiviral, antifibrotic, antivenom, antiulcer, hypotensive and hypocholesterolemia activities. For traditional Ayurvedics, turmeric plant was an excellent natural antiseptic, disinfectant, anti-inflammatory, and analgesic, while.

5. Amit D Kandhare, et al :-

Fenugreek (*Trigonella foenum graecum*) seed extract is a bioactive ingredient of many food supplements. Hence, there is a need for systematic assessment of the quality of published toxicological studies for its use in human health, hazard consideration, and risk assessment. The aim of the present investigation was to determine the reliability of published toxicological studies of fenugreek seed by using ToxRTool (Toxicological data reliability assessment tool). A comprehensive systematic literature search was conducted in PubMed, EMBASE, Cochrane Library, CPCIS, ICTRP, Ovid, and Google Scholar till October 2018. Each identified study was evaluated for its quality using the ToxRTool with outcomes such as combined score, weighted score, and reliability category by three independent raters. Correlations of various criteria groups with the combined score were evaluated by Pearson correlation and Kendall rank correlation coefficient. Inter-rater consistency was measured by Cronbach's alpha coefficient. The database searches initially yielded 436 results, of which 391 (89.67%) studies were "not assignable". The remaining 45 studies were included for quantitative analysis by ToxRTool. Based on the weighted score, 17 in-vivo, and 3 in-vitro studies were determined to be "Reliable Without Restriction" which were conducted according to international guidelines such as GLP. These studies have a significant difference ($p < 0.05$) for the combined and weighted score as compared to non-GLP studies. Remaining 28 in-vivo and 2 in-vitro studies were determined to be "Not Reliable." The GLP studies conducted with "identified study material" have a significant difference ($p < 0.0001$) between combined and weighted score as compared to studies which used "non-identified study material". For criteria group of ToxRTool 1, III and V, the Pearson correlation with the combined score was found to be 0.875, 0.734 and 0.905, respectively and Kendall rank correlation coefficient was found to be 0.764, 0.551 and 0.752, respectively. Cronbach's alpha coefficient for combined score and weighted score were 0.920 and 0.887, respectively. In conclusion, the ToxRTool was found useful to identify seventeen toxicity studies of fenugreek seeds as "Reliable without Restrictions". These studies showed a broad margin of safety for the standardized extract of fenugreek seeds and can form a basis for toxicological risk assessment with reasonable certainty.

6. **jhajhria, et al:** *Trigonella foenum-graecum* plant is also known as methi and used in Ayurvedic medicines for the treatment of bronchitis, rheumatoid arthritis, abscesses or wounds and digestive abnormalities. The review article has been made for the standardization and phytochemical evaluation of Fenugreek seeds and this one comprises of powder microscopy, fluorescence analysis and some other physio-chemical constants such as foaming index and swelling index. In modern food technology Fenugreek is used as food stabilizer, adhesive and emulsifying factor because of its gum, protein and fibre content. It is a rich source of calcium, iron and other vitamins. In this study after a general discussion of physio-chemical constituents, the biological & pharmacological reactions of Fenugreek such as anti-diabetic activity, antihypercholesterolemia properties, anti-toxic activity, anti-cataract activity, immunomodulatory activity and anti-oxidant activities were briefly investigated. The results of these studies provide a complete understanding of the biological action of *T. foenum-graecum* © 2016, International Journal of Pharmaceutical Sciences Review and Research. All rights reserved.
7. **Nasim Khorshidian et al :-** Fenugreek (*Trigonella foenum graecum*), native to southern Europe and Asia, is an annual herb with white flowers and hard, yellowish brown and angular seeds, known from ancient times, for nutritional value beside of its medicinal effects. Fenugreek seeds are rich source of gum, fibre, alkaloid, flavonoids, saponin and volatile content. Due to its high content of fibre, fenugreek could be used as food stabilizer, adhesive and emulsifying agent to change food texture for some special purposes. Some evidences suggest that fenugreek may also be regarded as antidiabetic,

anticarcinogenic, remedy for hypocholesterolaemia and hypoglycaemia, antioxidant, antibacterial agent, gastric stimulant, and anti-anorexia agent. The present article is aimed to review the potential applications of fenugreek as a functional food and nutraceutical

8. **Sajad Ahmad Wani, et al:-** Fenugreek (*Trigonella foenum-graecum*) is a legume and it has been used as a spice throughout the world to enhance the sensory quality of foods. It is known for its medicinal qualities such as antidiabetic, anticarcinogenic, hypocholesterolaemia, antioxidant, and immunological activities. Beside its medicinal value, it is also used as a part of various food product developments as food stabilizer, adhesive, and emulsifying agent. More importantly it is used for the development of healthy and nutritious extruded and bakery product. The present paper reviews about nutraceutical properties of fenugreek and its utilization in various product developments.
9. **MSN Eva Bryer CNM et al :-** Mild-to-moderate nausea and vomiting of pregnancy affects up to 80% of all pregnancies. Concerns about antiemetic use and the time-limited nature of symptoms has restrained the development of effective treatment approaches, yet supportive, dietary, and lifestyle changes may be ineffective. This article reviews 4 recent well-controlled, double-blind, randomized clinical studies that provide convincing evidence for the effectiveness of ginger in treating nausea and vomiting of pregnancy. It also provides a dosage update for the various forms of ginger.
10. **Vijity Vader, et al :-** Ginger (*Zingiber officinale*) is a flowering plant whose rhizome, ginger root or ginger, is widely used as a traditional medicine. Ginger is loaded with antioxidants, compounds that prevent stress and damage to your body's DNA. They may help your body fight off chronic diseases like high blood pressure, heart disease, and diseases of the lungs, plus promote healthy aging. Doctors recommend consuming a maximum of 3-4 grams of ginger extract per day you're pregnant, don't consume more than 1 gram of ginger extract per day. Ginger is not recommended for children under the age of 2. The first written record of ginger comes from the Analects of Confucius, written in China during the Warring States period (475-221 BC). Though it grows in many areas across the globe, ginger is "among the earliest recorded spices to be cultivated and exported from southwest India".

Acknowledgment:

Acknowledgment of polyherb syrup's bacteria underscores the potential of herbal remedies in combating microbial infections.

Conclusion & Result:

The preformulation studies of formulation were within specification. Also, the physiochemical properties of Prepared syrup like color, odour, pH, Taste were satisfactory. According to present study, prepared formulation exhibited antimicrobial against bacterial *E. coli* & minimum activity was observed in *Styphyllococcus aureus*.

Reference :-

1. Therapeutic Applications of Fenugreek -(<http://www.ncbi.nlm.nih.gov/pubmed/2194788>).
2. Effect of fenugreek seeds on blood glucose and serum lipids in type 1 diabetes (<http://www.ncbi.nlm.nih.gov/pubmed/12611558>).
3. Bent S. Herbal medicine in the United States: Review of efficacy, safety, and regulation. *General Internal Medicine*. 2008;23(6):854-859.
4. Kessler RC, Davis RB, Foster DF, Van Rompay MI, Walters EE, Wilkey SA, Kaptchuk TJ, Eisenberg DM. Long-term trends in the use of complementary and alternative medical therapies in the United States. *Annals of Internal Medicine*. 2001;135(4):262-268.

5. Bodeker G, Burford G. Traditional, complementary and alternative medicine: Policy and public health perspectives. *Bulletin of the World Health Organization*. 2007;86(1):77-78.
6. Barrett B, Kiefer D, Rabago D. Assessing the risks and benefits of herbal medicine: An overview of scientific evidence.
7. *Alternative Therapies in Health and Medicine*. 1999;5:40-49 7. Nortier JL, Martinez MC, Schmeiser HH, et al. Urothelial carcinoma associated with the use.
8. *General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine*. Vol. 13. Geneva: World Health Organization; 2000.
9. Shinde VM, Dhalwal K, Potdar M, Mahadik KR. Application of quality control principles to herbal drugs. *International Journal of Phytomedicine*. 2009:4-8
10. Mosihuzzaman M. Herbal medicine in healthcare An overview. *Natural Product Communications*. 2012;7(6):807-812
11. Coleman LM, Fowler LL, Williams ME. Use of unproven therapies by people with Alzheimer's disease. *Journal of the American Geriatrics Society*, 1995;43:747-750
12. Ansari FZ, Alam S, Jain P, Akhter S, Ansari MZH. Vitiligo and its herbal treatment. *Pharmacological Reviews* 2008;12:137-113
13. Parasuraman U, Thing GS, So DA. Polyherbal formulation: Concept of Ayurveda. *Pharmacognosy Reviews*. 2014;8(16):73-80
14. Spinella M. The importance of pharmacological synergy in psychoactive herbal medicines. *Alternative Medicine Review*, 2002;7:130-137
15. Mahima RA, Deb R, Latheef SK, Abdul Samad H, Tiwari R, Verma AK, Kumar A, Dhama K. Immunomodulatory and therapeutic potentials of herbal, traditional/indigenous and ethnoveterinary medicines. *Pakistan Journal of Biological Sciences*. 2012;15:754-774
16. Akhtar N, Ali M, Alam MS. Herbal drugs used in dental care. *Pharmacy Review*. 2005;10:61-68
17. Seigler DS. *Plant Secondary Metabolism*. New York: Springer Science Business Media, 1995 DOI: 10.1007/978-1-4615-4913-8 ISBN: 978-1-4613-7228-8: 978-1-4615- 4913-0 (eBook)
18. Delgoda R, Murray JE. Evolutionary perspectives on the role of plant secondary metabolites. In: Badal S, Delgoda R, editors. *Pharmacognosy, Fundamentals, Applications and Strategies*. 1st ed. Oxford, UK: Academic Press, 2017. pp. 93-100.
19. Wink M. Modes of action of herbal medicines and plant secondary metabolites. *Medicine* 2015-2-251- 286
20. Tachjian A, Maria V, Jahangir A. Use of herbal products and potential interactions in patients with patient cardiovascular disease. *Journal of the American College of Cardiology* 2010,55(6):515-525
21. Calixto 1. Efficacy, safety, quality control, marketing and regulatory guidelines for herbal medicines (phytotherapeutic agents). *Brazilian Journal of Medical and Biological*
22. *Research* 2000,33:179-189 22 Capasso R, Borrelli F, Aviello G, Mascolo N, Romano B. Phytotherapy and quality of herbal medicines. *Fitoterapia*, 2000,71(1):58-65
23. Ekor M. The growing use of herbal medicines. Issues relating to adverse reactions and challenges in monitoring safety. *Frontiers in Pharmacology*. 2013;4:177