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Review on Polyherbal Syrup for Various Pharmacological Activities



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ABSTRACT

Polyherbal formulation has been used all round the world because of its healthful and therapeutic application. It has also known as a polyherbal therapy or herb- herb combination. Polyherbal formulations designed by the combination of multiple herbs exhibit ample advantages over a single herb and allopathic medicine. This resulted in the emerging trend in herbal drug therapy worldwide. People are using herbal and plant-based medicines from centuries for safety, efficacy, cultural acceptability, and lesser side effect. It is due to increase of awareness and knowledge about medicinal plants and their usage. There is also a realization that natural medicines are safer and allopathic drugs are often ineffective in several ailments. More than 700 mono and polyherbal preparation in the form of decoction, tincture, tablets, and capsules from than 100 plants are in clinical use. From this, polyherbal syrups are more effective and convenient to use. This article gives brief idea about recent advancement in development and evaluation of polyherbal formulations in the form of syrup for various pharmacological activities.



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INTRODUCTION

God has gifted us with this beautiful nature which contain resourceful wildlife. Herbal plant has great growth potential in global market. Use of herbal drugs is increasing all over the world for various ailments as they are safe and devoid of adverse effects. The success of therapeutic benefits of natural plants and plant-based products are well known to humans since ancient times. Medicinal plants and herbs are an important source for the discovery of novel bioactive compounds, which have served and continue to serve as lead molecules for the development of new drugs. Polyherbal formulations with various active principles and properties have been used from old days to treat a wide range of human diseases. It is getting popularized day by day in developing and developed countries owing to its natural origin and lesser side effects. Polyherbal formulations are collection of therapeutic entities that are formulated and prepared based on the healing properties of individual ingredients according to the condition of sickness. Such plant constituents with diverse pharmacological activities principally work together in a dynamic way to produce maximum therapeutic benefits with minimum side effects [1].



BENEFITS OF HERB-HERB COMBINATION

Polyherbal formulations designed by the combination of multiple herbs exhibit ample advantages over a single herb and allopathic medicine. This resulted in the emerging trend in herbal drug therapy worldwide [2].

- High therapeutic effectiveness against a vast number of afflictions is exerted owing to the presence of numerous phytoconstituents. Factual assessments show an inclination for herbal preparations due to their adequacy and promising outcomes of the treatment [3].
- By abolishing the need to administer more than one single herbal formulation at a time, polyherbal preparations bring enhanced convenience for patients. As the administration of multiple herbs as one formulation shows better convenience, it indirectly marks improved patient compliance [4].
- The existence of multi-components in the combination serves to potentiate the action of one drug by another. Individual components when utilized alone, this enhancement in activity may not be attainable [4].

- Polyherbal formulations have a widespread therapeutic window. Being viable indeed at a lower dose and harmless at a higher dose, most of them have a predominant risk-to-benefit ratio [3].
- Herbal combinations with several constituents simultaneously act on diverse targets to elicit intensive alleviation. The presence of distinctive types of constituents remedies the affliction by distinctive mechanisms to provide a complete treatment against an illness [4].
- Due to synergism, polyherbal preparations are desirable. They can be prescribed at a lower dose to accomplish the required pharmacological action. This results in decreasing the possibility of harmful side effects as compared to allopathic medication [3][4].
- Synergism could be attained at the pharmacokinetic or pharmacodynamic level. Pharmacokinetic synergism is seen when the absorption, distribution, metabolism, and elimination of one herb are facilitated by another in the combination. Pharmacodynamic synergism is achievable by targeting active principles from multiple components toward common physiological systems [3][4].
- Having a natural source, developing a polyherbal formulation is economical and it is easily available. Global demand for PHF has increased due to accessibility and affordability, especially in developing countries [3].

More than 700 mono and polyherbal preparation in the form of decoction, tincture, tablets, and capsules from than 100 plants are in clinical use [5].

From this, polyherbal syrups are more effective and convenient to use.

SYRUP:

Syrup is viscous, concentrated or nearly saturated aqueous solution of sucrose containing 66.7% w/w of sugar.

1. Medicated syrup: Medicated syrups are nearly saturated solution of sugar in water in which medicaments and drugs are dissolved. It is intended for oral use.
2. Herbal syrup: An herbal syrup is prepared by mixing a concentrated decoction with either honey or sugar or alcohol. It is intended for oral use. Herbal syrups show more potent action than other types of syrup.

ANTI TUSSIVE ACTIVITY

Extract of Terminalia chebula, Mentha piperita, A. vasica, Zingiber officinale, O. sanctum, Glycyrrhiza glabra, Withenia somnifera and Piper longum were used to prepare the polyherbal syrup. The prepared syrup was investigated for their antitussive effect on citric acid induced cough model in guinea pig by Meher *et al.* According to the results, the formulated cough syrup exhibited significant antitussive activity in a dose dependent manner and the activity was compared with the prototype antitussive agent diphenhydramine HCl. Researchers had concluded that antitussive activity produced by the herbal formulation in the minimum dose was much better than the standard drug. Hence it can be concluded that the formulated polyherbal cough syrup in 1 ml exerts a significant antitussive effect in experimentally induced cough reflex in mice comparable to the standard drug Diphenhydramine hydrochloride [6].

Evaluation of antitussive activity of Honikof syrup in sulphur dioxide induced cough model in rats was studied by Lucia *et al.* Honikof syrups contains Ocimum sanctum, Glycyrrhiza glabra, Adhatoda vasica, Zingiber officinale, Piper longum, Curcuma longa, Piper nigrum, Pudina satva. Honikof tablets contain these same herbs as in Honicof syrup, but with different quantities and Herbigor Honey and Lemon Syrup. From the experiment, researchers concluded that the herbal formulations demonstrated significant ($P < 0.05$) antitussive activity in sulphur dioxide induced cough model. Thus, their study showed that the polyherbal formulation have significant ($P < 0.05$) antitussive effect in experimentally induced cough reflex in rats comparable to the standard drug codeine phosphate and this provides pharmacological evidence in support of these herbal products as antitussive agents [7].

This study was carried out by Gupta YK *et al.*, to evaluate anti tussive activity of combination of herbal drugs as formulations in sulphur dioxide (SO₂) induced cough model in mice. Albino mice of either sex, weighing 25-30 g were divided into eight groups, (n=6). Group 1 served as normal control, group 2 mice were given distilled water, group 3 was positive control and received codeine sulphate (10 mg/kg, p.o.) and group 4, 5, 6, 7 received coded 1 formulation 1, 2, 3 and 4 respectively at a dose of 0.3 ml/mice, orally, while group VIII was the vehicle control. Different formulations was formulated by using Justicia adhatoda(Vasaka), Curcuma longa (Haridra), Curcuma Zeodaria (Shati), Ocimum sanctum (tulsi), Piper longum (pippali), Solanum surratense (Kantakari), Voila odorata (Banafsha),

Vitis vinifera (Draksha), *Alpinia galangal* (Kulinjan), *Mentha arvensis* (Sat pudina), *Glycyrrhiza glabra*, Ammonium chloride (Navsadar) in different concentrations. Thirty minutes later, the mice were exposed to sulphur dioxide again for 45 sec. The mice were then placed in an observation chamber for counting of cough bouts, by two independent observers, for five minutes. All the formulations used showed significant antitussive activity in sulphur dioxide induced cough model. Thus, these formulations can prove to be useful for alleviating cough [8].

ANTI ANAEMIC ACTIVITY

RK was obtained from Shree Swami Samarth Ayurvedic Pharmaceuticals, Nashik, India by Payal *et al.*, which contains *Phyllanthus niruri* L., *Eclipta alba* L., *Embllica officinalis* Gaertn., *Cuminum cyminum* L., *Glycyrrhiza glabra* L., *Zingiber officinale* Roscoe, *Withania somnifera* (L.) Dunal, *Asparagus racemosus* Willd., *Boerhaavia diffusa* L., *Piper betle* L., *Ipomoea digitata* L., *Dioscorea bulbifera* L., *Rubia cordifolia* L., *Hemidesmus indicus* (L.) R. Br. ex Schult. and Loha Bhasma. The study was aimed at investigating anti-anaemic potential of polyherbal formulation, RK, against phenylhydrazine-induced anaemia in rats. Anaemia was induced by phenylhydrazine administration (40 mg/kg, IP) for 2 consecutive days. Anti-anaemic activity of RK was investigated by estimating blood parameters and pathological changes in liver, heart, spleen, and bone marrow. RK was found to contain tannins, steroids, phenolic compounds, flavonoids, and saponins. Anaemia was induced with the help of phenylhydrazine injections to rats causes significant decrease in red blood cells (RBCs), haemoglobin and haematocrit. These decreased levels of RBCs, haemoglobin and haematocrit in blood was significantly improved by the treatment with RK. Also, RK restored pathological changes in liver, heart, spleen, and bone marrow tissues near to normal. Hence, author concluded that RK has significant anti-anaemic activity against phenylhydrazine induced anaemia in rats. Iron estimation showed the presence of iron in RK which is useful against iron-deficiency anaemia. Thus, RK has beneficial effect against both iron deficiency as well as haemolytic types of anaemia [9].

ANTI CANCER ACTIVITY

A polyherbal compound (PHC, formulated as syrup) consisting of *Allium sativum*, *Curcuma longa*, *Panax ginseng*, and *Camellia sinensis* with honey and 70% sucrose solution. A randomized placebo-controlled trial was carried out by Azar *et al.*, on patients with oesophageal or gastric cancer who had finished their oncological treatments. The design of

the study was double-blind randomized placebo controlled. The patients were randomly assigned to PHC or placebo group. The PHC group was treated with the PHC (20 ml, three times daily) for 12 weeks, while the placebo group received 70% sucrose syrup (containing edible red colour). The Quality of Life was assessed at baseline and after 12 weeks. The patients were followed up to determine overall survival. PHC has shown to significantly improved cancer-related symptoms, psychological and social functions of the patients, and physical performance. Death occurred in 22% and 33% of cases in the PHC and placebo group, respectively. The mean survival time was 16.8 months in the placebo group and 21.4 months in the PHC group, but the difference was not statistically significant. The author has concluded that the PHC improved cancer-related symptoms, physical performance, and psychological and social functions in patients with gastrointestinal cancers [10].

Thapring is a Traditional Tibetan Medicine (polyherbal formulation) composed of *Terminalia chebula*, *Saussurea lappa*, *Acorus calamus*, *Aconitum ferox*, *Oxytropis microphylla*, *Commiphora mukul*, *Acacia catechu*, *Delphinium brunonianum* and a mineral ingredient. Evaluation of the pro-apoptotic and anti-tumorigenic properties of Thapring in hepatoma cells and in a transgenic mouse model of hepatocellular carcinoma was done by Tenzin et al. The growth inhibition property and pro-apoptotic action of Thapring were assessed in A549, Huh7, and HepG2 cell lines using MTT assay and flow cytometry, respectively. Serological studies for superoxide dismutase, vascular endothelial growth factor and liver function were assessed in the serum of X15-myc transgenic mice. Their study suggested that Thapring possesses a strong anti-cancer activity (growth inhibition, cell cycle arrest, proapoptotic activity) in hepatoma cells and shows minimal cytotoxic effect on non-hepatoma cells and nontransformed AML12 hepatocytes [11].

HEPATOPROTECTIVE ACTIVITY

Livergen syrup is made up of various herbal extract mixtures such as *Ipomoea turpethum*, *Oldenlandia corymbosa*, *Andrographis paniculata*, *Apium graveolens*, *Cyperus rotundus*, *Eclipta alba*, *Berberis lycium*, *Carum copticum*, *Picrorrhiza kurroa*, *Cichorium intybus*, *Trigonella foenumgraecum*, *Plumbago zeylanica*, *Solanum nigrum*, *Tephrosia purpurea*, *Terminalia arjuna*, *Terminalia chebula*. It was procured from local market by Arsul *et al.*, to evaluate hepatoprotective activity against carbon tetrachloride induced hepatotoxicity in rats. Standard drug used was Silymarin 100mg/kg, orally. Blood was collected for analysing normal levels of serum Glutamate Pyruvate Transaminase (SGPT) and serum Glutamate

Oxaloacetate Transaminase (SGOT), Alkaline Phosphatase (ALP), Total protein, Bilirubin and Cholesterol. Animals were divided into 4 different groups. Carbon tetrachloride was administered intraperitoneally for 5 days to produce hepatotoxicity followed by treatment of Livergen and standard Silymarin for further 5 days. On sixth day enzymatic levels were noted. Serum levels were recorded on 11th day. For determination of significant intergroup difference each parameter was analysed separately. The toxicity produced by CCl₄ is thought to be due to the reaction of free radicals with lipids and proteins. Significant decline in enzyme level of ALP, SGOT, SGPT, Bilirubin, Cholesterol had been shown from the polyherbal formulation Livergen. From the study it was concluded that the formulation shows significant hepatoprotective activity [12].

Livex is an herbal formulation composes of the extracts of nine medicinal plants viz. *Tephrosia purpurea*, *Aconitum heterophyllum*, *Solanum nigrum*, *Cichorium intybus*, *Cassia occidentalis*, *Tamarix gallica*, *Embelia ribes*, *Andrographis paniculate*, and *Piper longum*. Livex was evaluated for its possible hepatoprotective activity by Venkateswaran *et al.*, by using albino wistar rats as an experimental animal. Animals were randomly divided into three groups viz grp 1 (normal untreated), grp 2 (erythromycin estolate 800mg/kg/day), grp 3 (erythromycin estolate 800mg/kg/day and Livex syrup 5 ml/kg/day). Treatment was given orally for 10 days followed by scarification by decapitation method. Serum was obtained from collected blood by centrifugation. Liver was collected for histopathological study. The results had shown that the grp 2 animals show development of significant liver damage from elevated serum level of hepatospecific enzymes such as AST, ALT, ALP and different live parameters like cholesterol, triglycerides, free fatty acids, and phospholipids. Grp 3 animals shown to be low serum level of liver enzymes as compared to the alone erythromycin estolate treated animals. From histopathological evaluation it was concluded that Livex seems to offer protection and maintain the structural integrity of hepatocellular membrane [13].

ANTI ULCER ACTIVITY

This experiment had been carried out by Anjan *et al.*, to demonstrate the antiulcer activities of a polyherbal syrup prepared by Diastase, Papain, Nux-vomica Tincture, Compound Cardamom Tincture and Casein hydrolysed. Healthy 8–12-week-old Wistar rats (female) were utilized. They had been arbitrarily distributed among five group of 6 rats each. Group 1(control) was given distilled water and 1 ml 100% ethanol per kg b. w. orally. Group 2 and 3(test) was given prepared formulation 1.8 and 2 ml/kg resp. Group 4(standard) was given

Famotidine at a dose of 20 mg/kg. Group 5(normal) was given only distilled water. All animals were given one ml per kg of 100% ethanol orally after 45 minutes of formulation and famotidine administration. In anti-ulcer activity, ethanol induced ulcers have been identified in the rat's stomach and the volume of gastric juice, free acidity, total acidity, pH, lipase activity, amylase activity, gastric wall mucus content, total protein, pepsin activity, peristaltic movement, and gastric emptying activity were performed. By performing all the parameters, the author concluded that the prepared formulation has the anti-ulcer property and has the property to treat gastric diseases [14].

Maheshwari *et al.*, evaluated the antiulcer and antioxidant effects of Normacid syrup (a polyherbal formulation) on experimentally induced gastric ulcers. Normacid syrup contains *Ficus glomerata* Roxb, *Fagonia Arabica* L, *Vetiveria zizanioides* Stapf, *Santalum album* L., *Andrographis paniculata* Nees, *Melia azadirachta* L., *Terminalia chebula* Retz, *Terminalia bellerica* Roxb, *Embllica officinalis* Gaertn, *Trichosanthes dioica* Wall, *Adhatoda vasica* Nees, *Tinospora cordifolia* Miers, *Fumaria officinalis* L., Shauktik bhasma, Kapardika bhasma, and Praval bhasma. Swiss albino mice (25–30 g) of either sex was used for the study. Acute oral toxicity was determined under OECD guideline no. 423. Anti-ulcer activity of NS was evaluated by using pylorus ligation induced ulcer model and diclofenac induced ulcer model. Administration of NS significantly increases the gastric pH and decreases total gastric acidity and acid volume, thus decreases the factors responsible for gastric ulceration. Thus, NS may be considered to have potent anti-ulcer and anti-secretory activity [15].

ANTI ASTHMATIC ACTIVITY

Bharangyadi is a polyherbal compound which contains *Clerodendrum serratum*, *Hedychium spicatum* and *Inula racemosa* as an ingredient. Evaluation of the anti-asthmatic activity of Bharangyadi through various invitro and in-vivo experimental models was carried out by Divya Kajaria *et al.* The results showed that Bharangyadi has potent histamine antagonism property with significant mast cell stabilizing and spasmolytic activity in the experimental animals. Ethanolic extract of Bharangyadi at the doses 500 and 1000µg/ml protected from compound 48/80-evoked degranulation in dose dependent manner. Pre-treatment with Bharangyadi extract showed 80% and 86% protection from histamine induced bronchoconstriction in guinea pigs with 27.8% and 36.1% increase in preconvulsion time (equal to standard drug). Screening of Histamine antagonism activity on guinea pig ileum showed that Bharangyadi significantly reduces the smooth muscle contraction in dose

dependent manner. Increasing concentration of Bharangyadi extract with maximum dose of histamine showed maximum inhibition [16].

ANTI DEPRESSANT ACTIVITY

The herbal syrup was prepared by Zakerin *et al.*, by decocting a mixture containing *Lavandula angustifolia*, *Melissa officinalis*, *Echium amoenum*, *Cordia myxa*, *Glycyrrhiza glabra*, *Ziziphus jujuba*, *Foeniculum vulgare*, *Fumaria parviflora*, *Adiantum capillus-veneris*, and *Alhagi spp.* along with glycerin and potassium sorbate. Physicochemical characteristics of the syrup were examined. An accelerated stability test was carried out for developed syrup. Wistar male rats weighing 220–250 g, were used in the study. The animals were divided into six groups. The control group received distilled water. The dose of 3.3ml/kg of the syrup was given to syrup group. The positive control group received fluoxetine at the dose of 20mg/kg. The SH was treated with only syrup excipients. The treatment was given once a day for three weeks via intra-gastric gavage (i.g.). Forced swimming test was carried out for antidepressant evaluations. The serum levels of serotonin (5-HT), noradrenaline (NA), and brain-derived neurotrophic factor (BDNF) were determined in rats as well. Histopathological examinations were done on spleen, liver, and kidney. The results had shown that the herbal syrup was brown in colour with a special taste and flavour. The polyherbal syrup decreases immobility time through increasing in NA and 5-HT levels without affecting BDNF levels thus exhibited significant antidepressant effects. Liver, kidney, and spleen did not show any toxic effect. The experiment revealed that the formulated herbal syrup exhibited antidepressant effects in the FST rat model, which was mediated by increasing 5-HT and NA and could be a suitable choice for depression after clinical trials [17].

The polyherbal formulation was prepared by Rinki *et al.*, consisting of four extracts of medicinal plants i. e. *Nyctanthes arbor-tristis*, *Hippophae salicifolia*, *Ocimum tenuiflorum* and *Withania somnifera*. Antidepressant effects of the prepared polyherbal syrup was evaluated by using forced swim test, behavioural assessment, and biochemical assay. Animals were divided into six groups. The forced swim acts like depressive-like behaviour in rats. It was observed that the significant reduction in depressive-like behaviours in the stressed rats treated with polyherbal formulation and sertraline. The anxiety evaluation was carried out by mirror chamber test. In which it was found that the polyherbal formulation and Sertraline both significantly increase the time spent, number of entries and decreases latency entries. For cognitive behaviour and memory enhancing performance the elevated plus maze test was

used. The results had shown that PF and sertraline both promote glucocorticoid production and release in the adrenal cortex. PF were shown to cause increased level of acetylcholine and malondialdehyde in the brain of depressed rats as compared with standard. The study was concluded that the polyherbal formulation have potent antidepressant activity [18].

ANTIOXIDANT AND IMMUNOMODULATING ACTIVITY

A Polyherbal formulation with Brand Name Rizer Syrup (RS) is prepared from Ashwagandha (*Withania somnifera*), Shatavari (*Asparagus racemosus*), Amla (*Embllica Officinalis*), Haritaki (*Terminalia chebula*), Bibhitaki (*Terminalia bellirica*), Gokshura (*Tribulus Terrestris*), Bala (*Sida cordifolia*), Varahikand (*Dioscorea bulbifera*), Vidarikand (*Pueraria tuberosa*), Bhringraj (*Eclipta alba*), Kaucha (*Mucuna Pruriens*) as active ingredients. The study was aimed at evaluating the therapeutic effect of Rizer Syrup indicated in oxidative stress, low immunity, and General Debility like condition. Ankur *et al.*, had performed an antioxidant activity with 1,1- Diphenyl-2-Picryl Hydrazyl (DPPH) assay and Hydrogen peroxide(H₂O₂) assay by using a methanolic extract of Rizer Syrup and Ascorbic acid as the reference standard. The IC₅₀ value in DPPH assay for Ascorbic acid and alcohol extract of Rizer syrup was 19.82µg/ml and 56.52µg/ml respectively. The IC₅₀ values in H₂O₂ scavenging assay was found to be 24.70µg/ml and 57.50µg/ml for ascorbic acid and alcohol extract of Rizer syrup respectively. By using Neutrophil Adhesion Test in vivo immunomodulatory activity was performed. Healthy albino rats of wistar strain were used for the study. The % neutrophil adhesion in the control group animals was found to be 15.025±0.73. While in Rizer Syrup treated an animal group of three different doses were shows 18.170±0.90, 20.365±0.97 and 21.190±1.38 of % neutrophil adhesion in graduated increasing dose. The results of the studies showed that Rizer Syrup possesses antioxidant activity and immunomodulating activity. Rizer Syrup may explain its Rasayana effect and justify its use as a medicine for age associated diseases [19].

UPPER RESPIRATORY TRACT INFECTION

A polyherbal formulation named as SIVA syrup was made with different herbs such as Indigofera aspalathoides, Corallocarpus epigaeus, Solanum trilobatum, Wrightia tinctoria, Bacoba monnieri, Piper longum, Celastrus paniculatus, Leucas aspera, Piper nigrum, Piper betle, Tinospora cordifolia, and Zingiber officinale. Respiratory syncytial virus (RSV) is the chief cause of most of the upper respiratory infections in human being. Evaluation of the immunomodulatory effect of polyherbal formulation (SIVA syrup) against RSV infection in

animal model was done by Krishnamoorthy *et al.* Results of the studies suggested that polyherbal formulation of medicinal plants is a very potent immunomodulator and has a significant role in the treatment of upper respiratory infections in human being [20].

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD)

In this study Haide *et al.*, aimed to determine the efficacy and safety of two herbal medicine products, including Rosa canina L. and a polyherbal formulation syrup, on the clinical manifestations of ADHD in children and adolescents. RC contains Rosa canina L. extract; PHF contains Vitis vinifera L., Ocimum basilicum L., and Malus domestica Borkh. extract and placebo are considered sucrose. This study was a randomized, double-blind, placebo and active product controlled, multicentre clinical trial with three parallel treatment arms to compare the efficacy of two herbal products in children and adolescents with ADHD. Ninety ADHD patients (aged 5–14 years) based on DSM-5 diagnostic criteria had randomly assigned equally into three groups: (1) RC syrup + methylphenidate (MP), (2) PHF syrup + MP, and (3) placebo + MP according to the inclusion criteria (30 subjects in each group). The syrup dosage is 5cc every 8 h, and MP had a stabilized dose for 8 weeks during the study. Moreover, Conner's questionnaires had completed by the teacher and parents before the intervention and then every 4 weeks. Also, the Child Symptom Inventory-fourth edition (CSI-4) and temperament questionnaires had completed before the intervention and every 4 weeks until 2 months. So, the authors concluded that RC and PHF syrups will be valuable for the management of ADHD. This trial was the first experiment to determine the effects of RC and PHF syrups on the clinical manifestations of ADHD in children and adolescents. Their findings have provided new insight into the effect of these herbal products on the clinical manifestations of ADHD [21].

ANTI DIABETIC ACTIVITY

M. Senthil Kumar *et al.*, developed an Polyherbal anti-diabetic herbal syrup by using an extract of leaves of *Gymnema sylvestre* (meshashringi) and dried seeds of *Syzygium cumini* (indian black jamun). Three formulations of herbal syrup were formulated i.e., F1 (10gm meshashringi leaf powder), F2 (10gm indian black jamun seed powder), F3 (5gm of both meshashringi leaf powder and indian black jamun seed powder). F1, F2, F3 formulation were prepared and evaluated. In vitro evaluation for anti-diabetic syrup had done by using glucose bound test. Evaluation parameters of these formulation was found to be within the standard

limits and invitro studies were performed for detection of anti-diabetic activity shown a potent anti diabetic action [22].

APKJ-004, the polyherbal extract prepared from the seeds of *Eugenia jambolana* and barks of *Cinnamomum zeylenicum* as hydro alcohol and aqueous extracts. A study was designed by Padmanabha *et al.*, for assessment of toxicity and therapeutic efficacy (antidiabetic activity) of the polyherbal extract APKJ-004. The acute and sub-acute toxicity were conducted in wistar rats. The results of toxicity assessment revealed that clinical, histopathological, and biochemical parameters studied were in normal range and comparable to controls. The study revealed that no toxic symptoms observed throughout the period of exposure. Based on the results obtained it was concluded that APKJ-004 polyherbal extract act as a potent antidiabetic agent with minimal or no side effects and useful in the pharmacotherapy of diabetes [23].

ANTI MICROBIAL AND ANTI BACTERIAL ACTIVITY

A polyherbal preparation was prepared from the decoction of the aerial parts of *Rhynchosia recinosa*, the stem barks of *Ozoroa insignis*, *Maytenus senegalensis*, *Entada abyssinica* and *Lanea schimperii* and evaluated for its safety and efficacy. The individual extracts and polyherbal preparation were tested for antibacterial activity against four Gram negative bacteria; *Escherichia coli* (ATCC 25922), *Salmonella typhi* (NCTC 8385), *Vibrio cholerae* (clinical isolate) and *Klebsiella pneumoniae* (clinical isolate) using the microdilution method by Emmanuel *et al.* In addition, the extracts were evaluated for brine shrimp toxicity and acute toxicity in mice. The combined extract of the five plants exhibited a dose dependent protective activity in the rat ethanol-HCl gastric ulcer model. The extracts were shown to exhibit weak antibacterial activity against four Gram negative bacteria and low acute toxicity in mice and brine shrimps [24].

In this study four different crude extracts were prepared from the leaves of *Ocimum sanctum*, *Boswellia serrata*, rhizomes of *Zingiber officinale* and roots of *Glycyrrhiza glabra* by Barik *et al.* An attempt has also been made to formulate polyherbal syrup and suspension by using these extracts. The anti-microbial activity of the prepared polyherbal formulations and the crude extracts were tested against some bacterial strains which are responsible for generation of various types of respiratory diseases. The polyherbal formulations and all the extracts exhibited antibacterial activity in concentration dependent manner but the polyherbal formulations displayed better activity than that of their crude extracts. The combined activity

of phytoconstituents present in the extracts had shown better activity of the prepared formulations. The results from the present work support the incorporation and utilization of herbs in the formulations to give better effect for the management of respiratory diseases by polyherbal formulations [25].

ANTI ARTHRITIC ACTIVITY

Maharasandhi quathar is a polyherbal formulation comprising of 26 different medicinal plants having different pharmacological activities viz. reduction of inflammation, anti-pyretic activity, reduction of pain, improve appetite and digestion, immunostimulants, laxative, diuretics. Composition of the MRQ consist of *Alpinia calcarata*, *Sida cordifolia*, *Ricinus communis*, *Cedrus deodara*, *Kempteria galanga*, *Acorus calamus*, *Adhatoda vasica*, *Zingiber officinale*, *Terminalia chebula*, *Piper chaba hunter*, *Cyperus rotundus*, *Boerhaavia diffusa*, *Tinospora cordifolia*, *Argyra speciosa*, *Finiculum vulgare*, *Tribulus terrestrin*, *Withania somnifera*, *Aconitum heterophyllum*, *Cassia fistula*, *Asparagus racemosus*, *Nigella sativa*, *Barleria prionitis*, *Coriandrum sativum*, *Solanum melongena*, *Solanum xanthocarpum*, and *Tragia involutraca*. Any scientifically controlled investigation had not done on MRQ before. So, Thabrew *et al.*, conducted this research for the evaluation of anti-arthritic effect of MRQ using RA patients and rats as experimental models. Anti inflammatory effect was studied on carrageenan induced paw oedema in rats. The inhibitory effect of MRQ on rat erythrocyte haemolysis was assayed by heat induced haemolysis. Anti-inflammatory effect of MRQ was investigated by 5-Lipoxygenase inhibition assay to find out whether it is attributed with leukotriene mediated effects. Determination of analgesic effect was carried out by using hot-plate and tail-flick techniques. Effect on RA patients was studied to check the activities of alanine amino transferase, aspartate amino transferase, and alkaline phosphatase along with bilirubin concentration. The overall results had shown that the MRQ has significant anti-inflammatory ant analgesic activities. The anti-arthritic activity may be due to membrane stabilization, alteration in synthesis of prostaglandins and leukotrienes, and antioxidant activity [26].

CONCLUSION

Different research papers have been studied to evaluate the effects of polyherbal syrup on various pharmacological activities. From the overall results it can be concluded that the polyherbal syrups are therapeutic effective at lower doses with less side effects than the allopathic ones. Polyherbal formulations designed by the combination of multiple herbs

exhibit ample advantages over a single herb and allopathic medicine. Due to synergism, polyherbal preparations are desirable. They can be prescribed at a lower dose to accomplish the required pharmacological action. This results in decreasing the possibility of harmful side effects as compared to allopathic medication.

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