



PREPARATION AND STANDARDIZATION OF POLY-HERBAL FORMULATION FOR RHEUMATOID ARTHRITIS

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Article Received on
06 June 2017,

Revised on 27 June 2017,
Accepted on 18 July 2017

DOI: 10.20959/wjpps20178-9675

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ABSTRACT

Rheumatoid arthritis is chronic, progressive, autoimmune disease characterized by inflammation of joints, damaging cartilage and bone around the joints. Although numbers of synthetic drugs are used to treat rheumatoid arthritis but they have adverse effect that can compromise the therapeutic treatment. There are so many medicinal plants that have shown anti rheumatoid arthritis properties. Standardization of formulations is essential in order to assess the quality based on the concentration of their active principles, physical, chemical, Phyto-chemical, standardization, *In-vitro*, *In-vivo* parameters. The present research work on standardization of poly-herbal formulation is used to Rheumatoid arthritis. In this herbal

formulation consists of *Spathodea Companulata*, *Zingiber Officinalalis*, *Pongamia Pinnata*, *Curcuma Longa*, *Aloe Barbadensis*, *Lawsonia Inermis*, *Piper Nigrum*. The poly-herbal formulation is one of the best remedy for Rheumatoid arthritis etc. The quality assessment of herbal formulations is important in order to justify their acceptability in modern system of medicine against various arthritic diseases. In this study authentication, organoleptic evaluation, ash, extractive values, and physical characteristics like determination of Carr's index and bulk density.

KEYWORDS: Poly-herbal, Arthritis, Standardization, *Curcuma Longa*, Carr's index.

INTRODUCTION

Rheumatoid arthritis (RA) is an ongoing autoimmune disorder that mainly affects joints. It characteristically results in swollen, warm and painful joints. Pain and stiffness often exacerbate following rest. Most frequently, the wrist and hands are concerned, with the same joints usually implicated on both sides of the body.^[1,2] Although numbers of synthetic drugs are used to treat rheumatoid arthritis but they have adverse effect that can compromise the therapeutic treatment. There are so many medicinal plants that have shown anti rheumatoid arthritis properties. Standardization of herbal formulations is essential in order to assess of quality drugs based on the active principles, physical characteristics, chemical characteristics, Phyto-chemical parameters, standardization, *In-vitro*, *In-vivo* parameters. Plant material when used in large quantity may vary in its chemical content and therefore, in its therapeutic effect according to different types of cultivation and collection, harvesting, drying and storage on different climatic conditions. In the condition the quality of herbal medicines may be fluctuate.

The quality assessment of herbal formulations is of paramount importance in order to justify their acceptability in modern system of medicine.^[3] One of the major problems faced by the herbal drug industry is the lack of rigid quality control monographs for herbal materials and their formulations. The subject of herbal drug standardization is massively and deep. There is so much to know and so many seemingly contradictory theories on the subject of herbal medicines and their relationship with human physiology. The standardization of raw material and end product gives authentic, uniformity in manufacturing of herbal formulations so as to ensure quality control and quality assurance.^[4] It needs to explore the medicinally important plants. This can be achieved by evaluating and analyzing using sophisticated modern techniques of standardization.^[5] The standardization of poly-herbal formulation is used to treat rheumatoid arthritis. In this herbal formulation consist of *Spathodea Companulata*, *Zingiber Officinalalis*, *Pongamia Pinnata*, *Curcuma Longa*, *Aloe Barbadensis*, *Lawsonia Inermis*, *Piper Nigrum*.

Spathodea Companulata The plant *Spathodea companulata* is used traditionally by the tribal people and native local healers for the treatments of wounds, fractured bones, body pains, diarrhea, dysentery, convulsions, dementia, and used as hypoglycemic agent, diuretic.^[6,7] It is used for the convulsions in children and healing for fractured bones.^[8]

Crushed leaves are used to treat mouth infections in children.^[9] Leaves infusion is used to treat induration of breasts and warty vaginal discharges.^[10]

The plant studies have reported, that the plant *Spathodea companulata* showed wound healing,^[11] Abortifacient and Antiimplantation.^[12] Relaxant activity.^[13] Anti diarrhoeal.^[14] and Anti-bacterial.^[15]

Zingiber Officinalis

Ginger is *Zingiber Officinale* (Zingiberaceae) the one of the most useful herbal supplement. It native of South East Asia, but it is cultivated in Caribbean island, Africa, Australia, Mauritius, Taiwan and Indi. More than 30% of production in India. Ginger is consists of volatile oil, starch, fat, fibre, inorganic material, residual moisture.^[16] Ginger oil contains monoterpene, hydrocarbons, sesquiterpene hydrocarbons, oxygenated mono and sesquiterpenes. Ginger is used as stomachic, an aromatic, a carminative, stimulant, flavouring agent. It is used to treat nausea, vomiting, diarrhoea.^[17] It is also used as antioxidant, anti-inflammatory, antiseptic, anticarcinogenic, antifungal, Anti-microbial. Ginger extract is one of the effective arthritis joint pain remedies recommended by physicians. Main constituents are sesquiterpenoids, with (-) zingiberene. Sesquiterpene Lactones (SLs) are natural products responsible for its anti-inflammatory activity.^[18,19] Ginger has been used for thousands of years in ayurvedic medicine and other systems of traditional medicine, as an anti-inflammatory agent. Ginger is found to be very effective in the treatment of arthritis and helps to alleviate pain. A mixture of soups, sauces or salads with ginger could be used in the treatment of arthritis.^[20]

It is the potent memory enhancer in scopolamine inducing memory impairment by significantly increased whole brain acetyl cholinesterase inhibition activity. The rhizomes implicated in the treatment of cardiac diseases, piles, colic, asthma, diseases of kapha, vata and pitta. It also reported to posse's anti-obesity enhances teach a morrison water maze and inhibits the β -amyloid peptide-accumulation, thus useful delaying the onset and progression of neurodegenerative disorders.

Pongamia Pinnata

Pongamia Pinnata (Leguminosae) is the tree. The aim of present work was to screen traditionally *Pongamia pinnata* leaves are used to treat arthritis. Literature survey of *Pongamia pinnata* has claimed to have anti-inflammatory, anti-plasmodial, anti-nociceptive,

and anti-hyperglycemic properties.^[21] Review of the limited scientific documentation on anti-inflammatory and anti-nociceptive activities was in conformation with the claims mentioned in literature, making it worthwhile to select this plant for validation of the unexplored claims.^[22]

Curcuma Longa (Zingiberaceae)

Curcuma longa belongs to family Zingiberaceae commonly known as turmeric have been used for the culinary properties in Indian curries and used as remedy against ageing. Turmeric is cultivated for its rhizome in India, China, Srilanka, Indonesia, Jamaica. Turmeric contains volatile oil, resins, starch grains and yellow color substances known as curcuminoids. The chief component of curcuminoids is known as curcumin. Curcumin, a natural compound present in the rhizomes of plant *Curcuma longa*, demonstrated its anti-inflammatory action.^[23] It is used in wound healing, hepatoprotection and neuroprotection etc. It has antimutagenic, antispasmodic, antimicrobial and anticancer activities. Daily ip administration of the low dose of purified curcuminoids (4 mg total curcuminoids/kg/d) inhibited joint inflammation in both the acute and chronic phases of arthritis.^[24,25,26] Turmeric is an extremely effective anti-inflammatory herb and acts as an effective pain reliever.

Curcumin and curcuminoids are the two essential chemicals that help to decrease inflammation and is the most recommended remedy for rheumatoid arthritis. Curcumin is antiinflammatory. Rhizome is antiprotozoal, spasmolytic, CNS active, antiparasitic, antispasmodic, antibacterial, antiarthritic, anthelmintic, carminative, antiperiodic, emollient, anodyne, laxative, diuretic, expectorant, alterative, alexertive, febrifuge, ophthalmic and tonic. Turmeric paste mixed with a little limejuice and saltpetre and applied hot is a popular application to sprains and bruises. In smallpox and chickenpox, a coating of turmeric is applied to facilitate the process of scabbing. The smoke produced by sprinkling powdered turmeric over burnt charcoal will relieve scorpion sting when the part affected is exposed to the smoke for a few minutes.

Aloe Barbadensis

Aloe barbadensis (Liliaceae) is cultivated in Europe and in many parts of India, including north-west Himalayan region. *Aloe vera* has been one of the most important plants used in folk medicine. Anthraquinone, anthracene, cinnamic acid and anthranilic acid are found in the *Aloe vera* plants that are responsible for its activity. *Aloe vera* is used in variety of skin ailments such as mild cuts, insect stings, bruises, poison ivy and eczema.^[27] It has also

antibacterial and antifungal properties, used as blood purifier, anti-inflammatory, diuretic, uterine tonic, spermatogenic, laxative, purgative and fever reliever.^[28] The anti-arthritis property of aloe vera is due to the anthraquinone compound. Aloe vera stimulates the immune system and it is a powerful anti-inflammatory agent. Topical application of aloe vera extract result in the reduction of inflammation and arthritis in adjuvant induced arthritis in Sprague Dawley rats,^[29,30] Aloe vera improved the hypoglycaemic effect of glyburide (glibenclamide) when one tablespoonful aloe juice was given orally in the morning and at bedtime to diabetic patients for 21 days. The juice (same dose) showed antihyperglycaemic activity (independently). (Francis Brinker.) Anthraquinone glycosides, known as aloin, in small doses act as a tonic to the digestive system, and at higher doses become a strong purgative, as well as increase colonic secretions and peristaltic contractions. Resin fraction is also as important as aloin in cathartic action. In *A. barbadensis* the highest percentage of aloin is 33%. Aloe produces pelvic congestion and is used for uterine disorders, generally with Fe and carminatives. The pulp is used in menstrual suppressions. A molecule in the Aloe vera gel, acemannan, stimulates macrophages and releases immune system potentiators; enhances function of T cells and interferon production. Animal studies have shown promising results in sarcoma. The carboxypeptidase and salicylate components of Aloe gel can inhibit bradykinin, a pain-producing agent; C-glycosyl chromone appears to reduce topical inflammation. Aloe gel also slows or inhibits the synthesis of thromboxane, which may accelerate the healing of burns.

Lawsonia Inermis

Lawsonia inermis (Linn), belongs to family Lythraceae it is a plant used all over the world. This plant is commonly known as Henna or Mhendi and abundantly available in tropical and subtropical areas. Ancient history of India describes its diverse uses and also plays appreciable role in Ayurvedic or natural herbal medicines. Henna has been used cosmetically and medicinally for over 9,000 years. Traditionally in India, henna is applied to hands and feet. Henna symbolizes fertility. Its use became popular in India because of its cooling effect in the hot Indian summers. Henna leaves, flowers, seeds, stem bark and roots are used in traditional medicine to treat a variety of ailments as rheumatoid arthritis, headache, ulcers, diarrhoea, leprosy, fever, leucorrhoea, diabetes, cardiac disease, hepatoprotective and colouring agent.

Lawsonia inermis L. is a much branched glabrous shrub or small tree, cultivated for its leaves although stem bark, roots, flowers and seeds have also been used in traditional medicine. The plant is reported to contain carbohydrates, proteins, flavonoids, tannins and phenolic compounds, alkaloids, terpenoids, quinones, Coumarins, xanthenes and fatty acids. The plant has been reported to have analgesic, hypoglycemic, hepatoprotective, immunostimulant, anti-inflammatory, antibacterial, antimicrobial, antifungal, antiviral, antiparasitic, antitrypanosomal, antidermatophytic, antioxidant, antifertility, tuberculostatic and anticancer properties.^[31]

It is now considered as a valuable source of unique natural products for development of medicines against various diseases and also for the development of industrial products. This review gives a bird's eye view mainly on the traditional uses, Phytochemistry and pharmacological actions of the plant.^[32]

Piper Nigrum

Piper longum L. belonging to the family Piperaceae, Black pepper is indigenous and cultivated in South India. It is also cultivated in Indonesia, Brazil, Malaysia and Shrilanka. India ranks first in the cultivation of this drug. Piper contains an alkaloid piperine, volatile oil, pungent resins, piperidine and starch. It is used as a aromatic, stimulant, stomachic and carminative. It increases the secretion of gastric juices. It also increases the bio-availability of certain drugs.^[33] Piperine isolated from black pepper. Piperine administered orally at a dose of 20 and 100 mg/kg/day for eight days cause decrease in the arthritic symptoms in carrageenan-induced acute paw arthritis.^[34]

Piperine extracted from this plant has been used as an ingredient in Ayurvedic formulations because of its antioxidant potency both in vitro and in vivo in mice. Piperine, due to this antioxidant property, is used topically in a cream base to treat sunburn diseases.^[35] Long pepper is a slender aromatic climber whose spike is widely used in ayurvedic and unani systems of medicine particularly for diseases of respiratory tract. Pipalarishta, Pippalyasava, Panchakola, Pippalayadilauha, and Lavana bhaskar churan are common ayurvedic preparations made out of the dry spikes of female types. It contains the alkaloid piperine which has diverse pharmacological activities, including nerve depressant and antagonistic effect on electroshock and chemo-shock seizures as well as muscular incoordination.

MATERIALS AND METHODS

Plant Material

This is a poly herbal formulation consisting of 7 ingredients Spathodea Complanata, Zingiber Officinale, Pongamia Pinnata, Curcuma Longa, Aloe Barbadensis, Lawsonia Inermis, Piper Nigrum. procured from medicinal garden, Nellore, India. And these were authenticated by prof. P.Jayaraman, Director, National institute of herbal science, W.Tambaram, Chennai.

Preparation of Poly-Herbal Formulation

Poly-herbal formulation was made by taking equal proportion of each powdered herbal drugs. All the procured and authenticated individual crude drug material was dried in shade and cleaned by hand sorting. The individual drugs are then pulverized and passed through mesh no.40. The individual powdered drugs are then subjected to the soxhlet extraction with suitable solvent. The concentrated and dried extract of individual plant drugs are weighed and mixed geometrically using a double cone blender. The mixed formulation was unloaded weighed and preserved in labeled glass bottle.^[36]

Organoleptic Evaluation

Organoleptic evaluation means conclusions drawn from studies resulted due to impressions on organs of senses. It refers to evaluation of poly herbal formulation by color, odour, taste, texture and touch.^[37]

Preliminary Phytochemical Analysis

The poly-herbal formulation was subjected to preliminary phytochemical screening for the detection of various plant constituents present in the plant drugs. In this preliminary phytochemical analysis various tests like i.e. Test for alkaloids, test for glycosides, test for carbohydrates, Test for steroids, Test for flavonoids, Test for terpenoids, and Test for proteins.^[38]

Physico-Chemical Evaluations

Physico-chemical investigations were carried out including determination of extractive values like Water soluble extractive, Alcohol soluble extractive, Ether soluble extractive and Hydro-alcoholic soluble extractive values were determined. Then Ash values like Total ash, Water soluble ash and Acid insoluble ash was determined. In Physico-chemical evaluation

determined the moisture content of the poly-herbal formulation by Loss on drying method at 105°C.^[39]

Determination of Physical Characteristics of Poly-Herbal Formulation

Physical characteristics like bulk density, tapped density, angle of repose, Hausner ratio and carr's index were determined for poly-herbal formulation.^[40]

Bulk density

The term bulk density refers to a indicating a packing of particles or granules. The equation for determining the bulk density (B_d) is following.

$$\text{Bulk density}(B_d) = \frac{M}{V_b}$$

Where M = Mass of particles

V_b = Total volume of packing.

The volume of packing can be determined in an apparatus consisting of graduated cylinder mounted on mechanical tapping device (Jolting Volumeter) that has a specially cut rotating can. 100gm of weighed poly-herbal formulation was taken and carefully added to cylinder with the aid of a funnel. The initial volume was noted and sample was then tapped until no further reduction in volume was noted. The initial volume gave the bulk density value and after tapping the volume reduced, giving the value of tapped density.

Angle of Repose

Angle of repose has been used as an indirect method quantifying powder flowability, because of its relationship with inter-particle cohesion. The fixed funnel and the free standing cone method employs a method that is secured with its tip at a given height (H), above the glass paper that is placed on a flat horizontal surface. Powder or granules were carefully poured through the funnel until the apex of the conical pile just touched the tip of funnel. Thus, with R being the radius of the conical pile.

$$\theta = \tan^{-1} \left[\frac{H}{R} \right]$$

Where θ = angle repose

H = Height of pile

R = Radius of pile

Hausner Ratio

Hausner ratio is related to inter-particle friction and as such can be used to predict the powder flow properties. The equation for measuring the Hausner ratio is

$$\text{Hausner ratio} = \frac{D_f}{D_b}$$

Where, D_f = Tapped density

D_b = Bulk density.

Carr's Index

Carr's index is another indirect method of measuring the powder flow from bulk density. The equation for measuring Carr's index is

$$\text{Carr's index} = \frac{\text{Tapped density} - \text{Bulk density}}{\text{Tapped density}} \times 100$$

RESULT AND DISCUSSION

In this research work the poly-herbal formulation was prepared and assessed the various characteristics for the standardization of poly-herbal formulation. In this standardization procedure poly-herbal formulation were tested for relevant organoleptic, preliminary phytochemical analysis, physicochemical evaluation and determination of physical characteristics like bulk density, tapped density, angle of repose and Hausner's ratio and Carr's index. The preliminary phytochemical analysis was conducted for poly-herbal formulation and identified different active constituents which are responsible for treating arthritis. The physicochemical characteristics are determined.

In these Physico-chemical characteristics like extractive values indicate the presence of acids, sugar and inorganic compounds. Less or more extractive values indicate addition of exhausted material, adulteration or incorrect processing during drying, storage or formulating. The ash values are like total ash indicate amount of minerals and earth materials present in the plant material. The deterioration time of poly-herbal formulation depends up on the amount of the water present in the plant material. If the water content is high the formulation easily undergoes to deteriorate due to microbial attacks. The physical characteristics of poly-herbal formulation were determined. Tapped density gives information on consolidation of a powder. The Hausner and Carr's Index both measure the flow properties of the powders. The smaller the Carr's Index the better the flow properties.

In this present study the poly herbal formulation were investigated by using DPPH scavenging test. The various medicinal plants of PHF showed effectively when compared with reference standard ascorbic acid. In the DPPH scavenging method is based on the capability of DPPH radical to decolorize in the presence of antioxidants. The DPPH radical is considered to be model of a stable lipophilic radical a chain reaction. In lipophilic radicals was initiated by the lipid autooxidation antioxidants react with DPPH reducing a number of DPPH molecules equal to number of their hydroxyl groups. Therefore, the absorption at 517 nm was proportional to the amount of residual DPPH In Figure-16, The PHF exhibited a significant dose dependent inhibition of DPPH activity, the IC₅₀ value of the PHF and reference standard ascorbic acid were found to be 53µg/mL and 37µg/mL respectively.

Table 2: Percentage yield of *Spathodea Companulata* (Bignoneaceae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
<i>Spathodea Companulata.</i> (Bignoneaceae)	Leaves and flowers				
		24.94	18.3	9.3	11.4

Table 3: Percentage yield of *Zingiber Officinalalis* (Zingiberaceae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
<i>Zingiber Officinalalis</i> (Zingiberaceae)	Rhizome				
		28.15	21.20	12.34	10.4

Table 4: Percentage yield of *Pongamia Pinnata*,. (Leguminoseae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
<i>Pongamia Pinnata</i> , (Leguminoseae)	Leaves				
		21.4	20.3	12.34	9.8

Table 5: Percentage yield of *Curcuma Longa* (Zingiberaceae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
<i>Curcuma Longa.</i> (Zingiberaceae)	Rhizome				
		27.80	23.20	12.34	8.5

Table 6: Percentage yield of *Aloe Barbadensis* (Liliaceae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
<i>Aloe Barbadensis.</i> (Liliaceae)	Fresh juice				
		25.2	19.3	8.3	11.6

Table 7: Percentage yield of *Lawsonia Inermis* (Lythraceae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
Lawsonia Inermis. (Lythraceae)	Leaves	24.90	18.3	11.2	10.4

Table 8: Percentage yield of *Piper Nigrum* (Piperaceae).

Plant name	Part used	% yield of extractive (%w/w)			
		Methanol	Ethanol	Pet. ether	Water
Piper Nigrum. (Piperaceae)	Ripe fruits	26.3	31.2	8.1	9.7

2.2 Qualitative phytochemical examination.

Preliminary phytochemical screening of *Spathodea Campanulata*, *Zingiber Officinale*, *Pongamia Pinnata*, *Curcuma Longa*, *Aloe Barbadensis*, *Lawsonia Inermis*, *Piper Nigrum* was carried out with different extracts and data represented in table.3.

Table 9: Phytochemical screening of the various plant extracts.

Tests	MESC	MEZO	MECL	MEAB	MEPP	MELI	MEPN
Alkaloids	-	-	-	-	-	-	+
Carbohydrates	+	+	+	+	+	+	+
Glycosides	+	+	+	+	-	+	-
Phytosterols	+	-	-	-	-	-	-
Lipids (Fats Fixed Oils & waxes)	-	+	+	-	+	+	+
Terpenoids	-	+	+	-	+	-	+
Phenolic & Tannins	+	+	+	+	+	+	+
Proteins & Amino acids	+	+	+	-	-	+	-
Gums & mucilage	+	+	+	+	+	+	-
Flavonoids	+	-	+	+	-	+	-

Table 10: Organoleptic characteristics of Poly-herbal formulation.

S. No	Organoleptic characters	Poly-herbal formulation
1.	Appearance	Powder
2.	Color	Pale green
3.	Odour	Pleasant
4.	Taste	Slightly bitter

Table 11: Preliminary phytochemical analysis of Poly-herbal formulation.

S. No	Phytochemical parameter	Results
1.	Alkaloids	+Ve
2.	Glycosides	+Ve
3.	Carbohydrates	+Ve
4.	Tannins	+Ve
5.	Resins	+Ve
6.	Terpenoids	+Ve
7.	Flavonoids	+Ve
8.	Steroids	+Ve
9.	Proteins	+Ve

Table 12: Physicochemical parameters of Poly-herbal formulation.

S. No	Physicochemical parameter	Results
1.	Water soluble extractive	6.2% w/w
2.	Alcohol soluble extractive	14.2% w/w
3.	Hydro alcoholic extractive	13.3% w/w
4.	Moisture content	1.35
5.	Total ash	13.2% w/w
6.	Acid insoluble ash	1.43% w/w
7.	Water soluble ash	14.7% w/w
8.	Carbonated ash	12.3% w/w
9.	Sulfated ash	74% w/w
10.	Nitrated ash	1.96% w/w

Table 13: Physical characters of Poly-herbal formulation.

S.No	Physical characters	Results
1.	Bulk density	0.511gm/cc
2.	Tapped density	0.503gm/cc
3.	Angle of repose	42°.3'
4.	Hausner ratio	0.989
5.	Carr's Index	16.25%

Table 14: Antioxidant activity by DPPH method.

S. No.	Concentration (µg/ml)	Absorbance of ascorbic acid	Absorbance of PHF	% scavenging DPPH of Ascorbic acid	%scavenging DPPH of PHF
1	20µg/ml	0.142	0.128	21.15	25.55
2	40µg/ml	0.102	0.089	53.42	59.36
3	60µg/ml	0.086	0.067	60.73	69.40
4	80µg/ml	0.058	0.039	73.51	82.19
5	100µg/ml	0.032	0.011	85.38	94.97

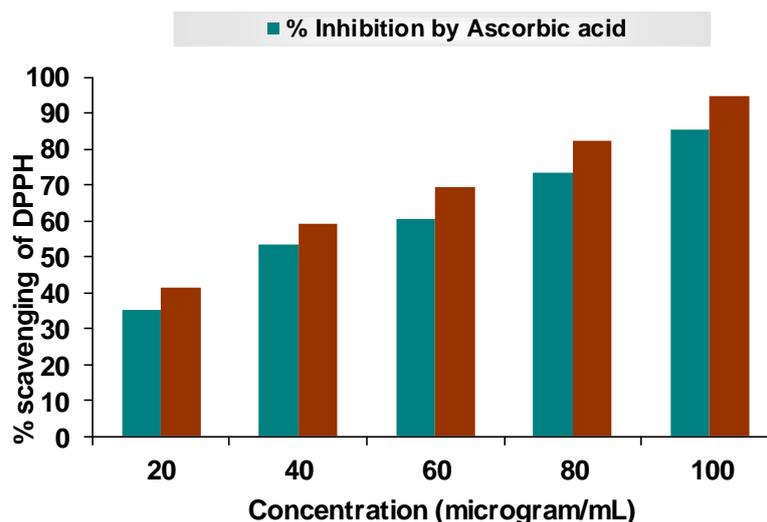


Figure 1: Antioxidant activity by DPPH method.

CONCLUSION

In this research work the Poly-Herbal formulation was prepared and assesses the various characteristics for the standardization of poly-herbal formulation. The preliminary phytochemical analysis was conducted for poly-herbal formulation and identified different active constituents which are responsible for treating rheumatoid arthritis. The physical properties of poly-herbal formulation were determined. Tapped density gives information on consolidation of an ointment. The Hausner and Carr's Index both measures the spreading properties of the ointment. In this present study the poly herbal formulation were investigated by using DPPH scavenging test. The various medicinal plants of PHF showed effectively when compared with reference standard ascorbic acid. The PHF exhibited a significant dose dependent inhibition of DPPH activity, the IC₅₀ value of the PHF and reference standard ascorbic acid were found to be 42 μ g/mL and 53 μ g/mL respectively. Based on the research studies *Spathodea Companulata*, *Zingiber Officinalalis*, *Pongamia Pinnata*, *Curcuma Longa*, *Aloe Barbadensis*, *Lawsonia Inermis*, *Piper Nigrum* having antioxidant principles are responsible for the prevention of Rhumatoid arthritis by reducing the free radical formation in the body.

ACKNOWLEDGEMENT

The authors wish to our beloved chairman, Mrs. Madhusudhan Reddy for his generous support for this study. This research was supported by the grants from Jagan's college of pharmacy.

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