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ANTI-ARTHRITIC POTENTIAL OF *ACONITUM FEROX* ROOTS IN COMPLETE FREUND'S ADJUVANT INDUCED ARTHRITIC RATS

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Abstract

Leaves were used in indolent ulcers, gallstones, ophthalmopathy, skin diseases, fever, cough, diarrhoea and abdominal pain, pruritus, cephalalyra, stomatopathy, leprosy, vomiting hiccup, insanity and galactorrhoea. The present study was designed to evaluate the anti-arthritic activity of *Aconitum ferox* root using complete freund's adjuvant induced arthritis in albino rats. It was extracted out by the soxhlet apparatus using different solvents including water and ethanol. The dose of *Aconitum ferox* was determined by Acute Oral Toxicity following OECD Guidelines. In this various parameters were evaluated including Hind paw volume and edema, Body weight changes, Locomotor activity, Hematological parameters, Estimation of lipid peroxidation and antioxidant status, Estimation of Superoxide dismutase (SOD) and Radiological assessment. In result, it demonstrated statistically significant level of anti-arthritic effect against freund's adjuvant induced artthritis in rats. In conclusion, it suggests identifying and isolating the specific compound needed to produce anti-arthritic effect that can be used in the treatment of Osteoarthritis in future.

Keywords: *Aconitum ferox* root, Locomotor and Arthritis.

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INTRODUCTION

Plant based medicines have been used by mankind since time immemorial. According to the report of World Health Organization (WHO), over 80 % of the world population relies on the traditional system of medicine, largely plant based, to meet their primary health care [1].Medicinal plants have been used in the form of folklore medicine or traditional medicine and ethnic medicine (Indian Herbal Pharmacopoeia, 1999). Herbs are the general way to support and tone the body's system. As with any therapy, one should work with health care provider to diagnose the problem before commencement of treatment [2]. Herbs are used as dried extracts (capsule, powder, teas), glyceride extract (glycerin extracts), or tinctures (alcohol extract) with various herbal preparations traditional systems had developed a science which deals with major disorder. However scientific evaluation of these treatments is the need of us to reinforce the trust of scientist and validate the traditional systems of medication [3]. In the last few decades there has been an exponential growth in the field of herbal medicine. It is getting popularized in developing and developed countries due to its natural origin and lesser side effects. Herbalism is a traditional medicinal or folk medicine practice based on the use of plants and plant extracts [4]. In the United States a CDC survey based on data from 2007–2009 showed 22.2% (49.9 million) of adults aged ≥18 years had self-reported and 9.4% (21.1 million) doctor-diagnosed arthritis [5].These are some factors responsible for inducing arthritis including rheumatoid factor, antinuclear factor (ANF), extractable nuclear antigen, and specific antibodies [6].Several Aconitum species have been used in cancers, diabetes mellitus, and pimples. Leaves used in indolent ulcers, gallstones, ophthalmopathy, skin diseases, fever, cough, diarrhoea and abdominal pain, pruritus, cephalalyra, otopathy, stomatopathy, leprosy, vomiting hiccup, insanity and galactorrhoea [7]. A brief anti-arthritic effect of *Aconitum ferox*had been evaluated [8]. But it has not been experimentally reported for its anti-arthritic activity against freund's adjuvant induced arthritis. So, the present study was designed to evaluate the anti-arthritic activity of *Aconitum ferox* root using complete freund's adjuvant induced arthritis in albino rats.

MATERIALS AND METHODS

Collection, Identification and Authentication of the plant

The plant was selected on the basis of morphology from Vindhya herbals Barkheda Pathani Bhopal (Madhya Pradesh). The plant was identified and authenticated by a botanist Dr. Zia UlHasan at Department of Botany, Safia Science College, Bhopal (MP) with a voucher Specimen no. 316/Bot/Safia/12.

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Extraction (Soxhlet)

The roots were shade dried. Then coarse powder of the roots of *Aconitum ferox* were subjected to successive soxhlet extraction with different solvents in increasing order of polarity from nonpolar to polar. Successive soxhlet extraction was rapid and continuous and might be employed in sparingly soluble constituent due to repeated extraction, which cannot be done by either percolation or maceration methods. Due to various advantages offered by soxhlet extraction, this method was selected for present study, using different solvents:

1. The dried coarsely powdered drug was weighed 227.66 g and packed in Soxhlet apparatus and defatted with Petroleum Ether (40-60^{0}c) till complete defatted. Complete defatting ensured by placing a drop by thimble on the filter paper which did not exhibited any oily spot.
2. The defatted material was removed from the soxhlet apparatus and air dried to remove the last traces of petroleum ether. The defatted material was subjected to extraction by Ethanol as solvent by soxhlet apparatus and finally with water by maceration process. The completion of extract was confirmed by evaporating a few drops (extract) on the watch glass and ensured that no residue remained after evaporating the solvent.

The marc extract was air dried before extracted with the next solvent. The marc obtained from the Ethanol extraction was dried and macerated with water for 24 h. The solvent removed by distillation and last traces of solvent being removed under vacuum. The extract obtained with each solvent was weighed.

Dried and powdered roots

↓

Extraction with petroleum ether (40-60^{0}C)

↓

(48 hours)

Extracted with Ethanol

↓

(72 hours)

Extracted with Water

Scheme: Successive solvent extraction procedure for *Aconitum ferox*root

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Table 1: Percentage Yield

Parts	Solvent	Extract's Color	Yield (g)	% Yield
Root	Ethanol	Dark Brown	42.573	18.70
Root	Water	Brownish Black	87.31	47.51

Animals

Healthy albino Lewis rats of either sexes weighing 200-250 g were used for the evaluation of acute oral toxicity test and anti-arthritic activity. The animals were used after an acclimatization period of 10 days to the laboratory environment. Animal were obtained from animal house of VNS institute of pharmacy, Bhopal. Ethical clearance for the handling of animals and procedure used in study was obtained from institutional animal ethical committee prior to the beginning of the study; CPCSEA Reg. no. 778/PO/a/03/CPCSEA; 03.09.03. All animals were stored in standard cages and maintained at 25°C, for 12 hours dark/ light cycle. The animals were fed with standard rat feed and water was given after specific interval prior to experiment animal were kept for 12 hours fasting.

Acute oral toxicity/ Dose regimen

Oral dose of *Aconitum ferox* was determined through the acute oral toxic test in rats by *Irwin Battery* test of *Aconitum ferox* roots at different doses. The dose level to be used as the starting dose is selected from one of four fixed levels, 5, 50, 300 and 2000 mg/kg body weight. The starting dose level should be that which is most likely to produce mortality in some of the dosed animals, the use of additional upper dose level of 5000 mg/kg body weight may be considered. At the dose of 50 mg/kg there was no mortality rate, so $^{1}/_{5}$th of this dose i.e. 10 mg/kg was selected for the study.

Table 2: Irwin Battery Test

Observation	Group I	Group II	Group III
Dose	100 mg/kg	300 mg/kg	50 mg/kg
Death	√	√	-
Convulsions	√	√	-
Tremors	√	√	-
Straul tail	-	-	-
Sedation	√	-	-
Excitation	-	-	-
Jumping	-	√	-
Abnormal gait	√	-	-
Catalepsy	-	-	-
Writhing	-	√	-
Piloerection	-	-	-
Stereotypy	-	√	-
Scratching	-	-	√
Aggression	-	-	-
Exopthalmia	-	-	-
Defecation/diarrhea	-	-	-
Salivation	-	-	-

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Experimental design

Table 3: Complete Freund's adjuvant (CFA) Induced Arthritis

(i)	Group I as Control	Sod. CMC 0.5% w/v in distilled water 5 ml/ kg, *p.o.*
(ii)	Group II as Arthritic control	*Mycobacterium Butyricum* in paraffin oil (10 mg/ml)
(iii)	Group III as standard	Diclofenac sodium suspended in 0.5% w/v sodium CMC, 2 mg/ kg *p.o.*
(iv)	Group IV	10 mg/kg *p.o.* body weight of ethanolic extract of roots of *Aconitum ferox*for 28 days
(v)	Group V	10 mg/kg body weight of ethanolic roots extract of *Aconitum ferox*for 14 days

Lewis rats of either sex weighing 180 ± 20 g was divided into five groups of six animals each. Group I served as control (without treatment), Group II served as arthritic control (negative control), Group III was treated with Diclofenac sodium (positive control) the standard anti-arthritic control, Group IV received *Aconitum ferox* extract for 28 days from the induction day (0-28 days treatment), Group V received *Aconitum ferox* extract for 14 days from the 14th day of induction (14th to 28th day treatment). The body weight change was observed on every week.

On 29th day, at the end of experiment, all animals were sacrificed by cervical decapitation and blood was collected in plain and EDTA containing tubes, respectively for plasma/serum separation. For histopthology, the proximal interphalangeal joints were removed, washed with saline and stored in 10% formalin. The interphalangeal joints sections were obtained stained with eosin-haematoxylin stain and examined by using 100 X magnifications. The hind (arthritis induced) legs of the experimental rats were taken X-ray, and examined for soft tissue swelling, bony erosions and narrowing of the spaces between joints.

Evaluation and Comparison of data obtained from roots by using following parameters

1. ***Hind paw volume and edema***

The hind paw volume increase was calculated as the percentage increase in hind paw volume on the experimental day 28 relative to the hind paw volume at the beginning of the experiment. Hind paw volume was recorded with the use of vernier caliper.

Percentage inhibition of Paw volume was calculated as below:

$$\% \text{ inhibition of edema} = \left(1 - \frac{\text{Mean increase in paw volume in}}{\text{Mean increase in paw volume in saline treated}} \right) \times 100$$

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2. *Body weight changes*

Weight loss after induction of arthritis and on subsequent days was observed and measured till the paw volume heals completely. Weight loss in various treatment groups was compared on 10^{th} day.

3. *Locomotor activity*

Locomotor activity was measured using actophotometer. From the day of induction arthritis in rat left paw, locotomors activity was measured for 10 days.

4. *Hematological parameters*

Hemoglobin was measured in rat blood by the Sahli's Hemoglobinometer before and after the induction of arthritis. After treatment with the standard, various extracts hemoglobin was measured and compared with the control group.

5. *Estimation of lipid peroxidation and antioxidant status*

Lipid peroxidation was estimated colorimetrically by measuring MDA formed after 22 h reperfusion. The tissue homogenate (2 mL) was added to 2 mL freshly prepared 10% w/v trichloroacetic acid (TCA) and the mixture was cooled in an ice bath for 15 min. The precipitate was separated by centrifugation at 276 *g* for 25 min at 0℃ C. Then, 2 mL supernatant solution (in triplicate) was mixed with 2 mL freshly prepare thiobarbituric acid (TBA; 0.67% w/v). The resulting solution was heated in a boiling water bath for 10 min. It was then chilled immediately in an ice bath for 5 min. The colour developed was measured at 532 nm against a reagent blank. The quantification of MDA was based on a standard curve constructed using standard MDA. Values were expressed as nmol MDA/mg protein.

6. *Estimation of Superoxide dismutase (SOD)*

Superoxide dismutase estimation was based on the generation of superoxide radicals produced by xanthine and xanthine oxidase, which react with nitro blue tetrazolium to form formazan dye. Superoxide dismutase activity was then measured at 560nm as the degree of inhibition of this reaction and was expressed as millimoles per minute per milligram tissue (mmol/min/mg tissue).

7. *Radiological assessment*

Prior to sacrifice of rats, the joints of the hind limb were imaged using an X-ray apparatus and industrial X-ray film for assessing the joint damage. The hind (arthritis induced) legs of the experimental rats were taken X-ray, and examined for the soft tissue swelling, bony erosions and narrowing of the spaces between joints. The X-ray apparatus was operated at 220 V with a 40 V peak, 0.2 s exposure time, and a 60 cm tube-to-film distance for anterior-posterior projection.

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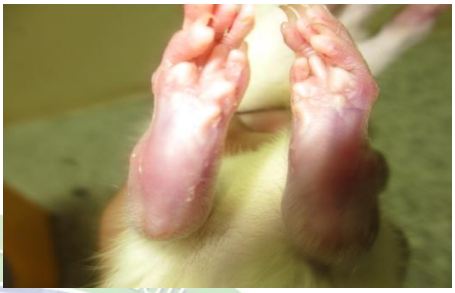
Statistical Data Interpretation

The results were expressed as the mean ± SEM for each group. Statistical differences were evaluated using a One-way analysis of variance (ANOVA) followed by Tukey's t-test. Results were considered to be statistically significant at $P<0.05$.

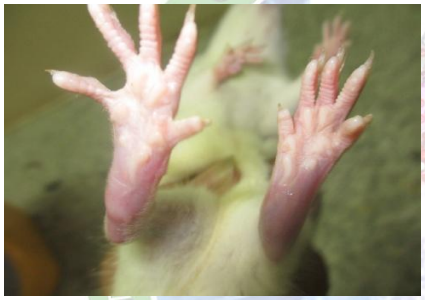
RESULT AND DISCUSSION

Anti-arthritis method

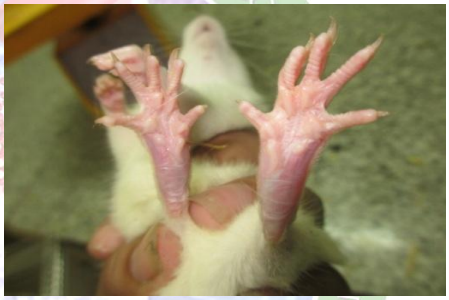
Control



Arthritic control



Standard

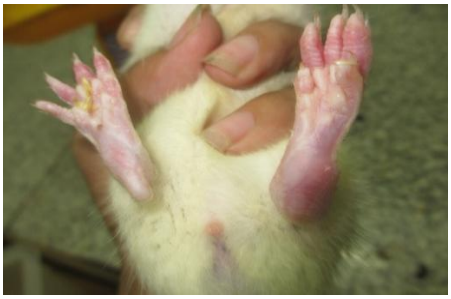


Treatment group I

Treatment group II

Fig.1: CFA induced inflammation in rats- Day 14

Control



Arthritic control

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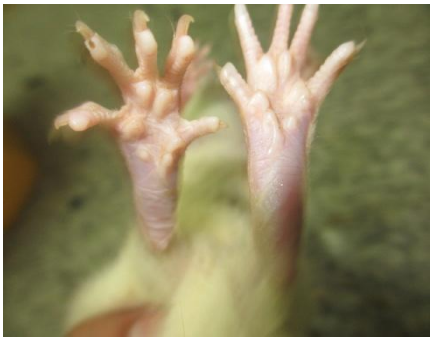
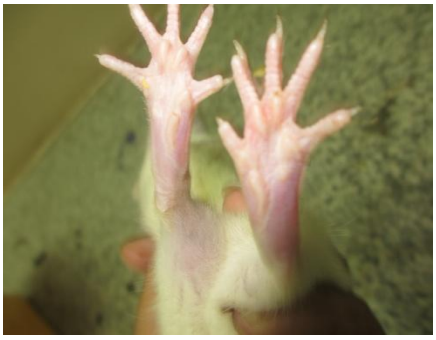
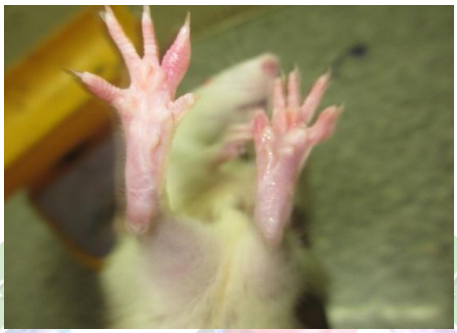


Standard



Treatment group I



Treatment group II

Fig. 2: CFA induced inflammation in rats- Day 28

Table 4: Mean changes in paw volume using Vernier calipers in adjuvant-induced arthritis in rats

Treatment Group	Days				
	0 day	**7 day**	**14 day**	**21 day**	**28 day**
Control	0.21±0.04	0.23±0.08	0.20±0.05	0.22±0.08	0.21±0.08
Negative Control	0.22±0.04	0.82±0.08	0.87±0.08	0.88±0.14	0.84±0.07
Standard	0.21±0.04 (0.037%)	0.51±0.06*** (32.35%)	0.45±0.06*** (53%)	0.40±0.07*** (54.22%)	0.38±0.03*** (55.32%)
Treatment 1st	0.21±0.05 (0.038%)	0.68±0.22** (23.22%)	0.67±0.07** (34.23%)	0.61±0.04** (35.34%)	0.59±0.03** (36.44%)
Treatment 2nd	0.23±0.06 (0.037%)	0.80±0.08* (0.2 %)	0.86±0.06* (0.1%)	0.74±0.08* (16.76%)	0.63±0.04* (23.86%)

Values are Mean ± S.E.M, n = 6 animals in each group. Values in parenthesis indicate % inhibition of rat paw edema of treated groups Vs arthritic control group II.

Results are Mean ± S.E.M. ANOVA, Tukey's test ***p < 0.001, **p <0.01,*p <0.05. According to the above study the arthritic activity of ethanolic extract of *Aconitum ferox* was effective.

Table 5: Percentage inhibition of paw volume in adjuvant induced-arthritis in rats

Treatment Group	0 day	7 day	14 day	21 day	28 day
Control	0	0	0	0	0
Negative Control	0	0	0	0	0
Standard	0.037	32.35	53	54.22	55.32
Treatment 1st	0.038	23.22	34.23	35.34	36.44
Treatment 2nd	0.037	0.2	0.1	16.76	23.86

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Table 6: Evaluation of Locomotor Activity

Treatment	Locomotor Activity			
	0 day	7 day	14 day	28 day
Control	133.5±0.02	127.25±0.46	126.5±0.245	122.66±0.43
Negative Control	126.5±0.13	122±0.18	110.75±0.10	101.0±0.57
Standard	129±0.19	121.2±0.13**	117.25±0.25**	115.6±0.23**
Treatment 1st	123.0±0.15	119.5±0.45**	113±0.29**	110±0.15**
Treatment 2nd	125.5±0.73	120.7±0.47*	117±0.12*	116.66±0.38*

Results are Mean ± S.E.M. ANOVA, Tukey's test **p < 0.001,*p<0.05

According to the above study the ethanolic extract is effective against arthritis.

Table 7: Effects of Aconitum ferox on Lipid peroxidation parameters of control and other groups

Groups	LPO (MDA nmol/gm proteins)
Control	28.7 ±0.11
Negative control	108.4±0.35
Standard	41.01±0.13**
Treatment 1st	37.5±0.55***
Treatment 2nd	77.4±0.69*

The effect of Aconitum ferox on lipid peroxidation in plasma of control and experimental rats. The level of lipid peroxidation (MDA) were found to be significantly increased in arthritis rats compared to the normol control rats (P<0.001). On the contrary, Aconitum ferox treatment to arthritis rats showed a significant lowering effect in lipid peroxidation levels in developing phase (P<0.0001).

Table 8: Effects of *Aconitum ferox* on SOD parameters of control and other groups

Groups	SOD (U/ mg protein)
Control	272.60 ±0.04
Negative control	81±0.05
Standard	211±0.03**
Treatment 1st	201±0.05***
Treatment 2nd	144±0.09*

The effect of Aconitum ferox on the antioxidant profile (SOD) in plasama of the control and experimental rats. A significant reduction in the levels of the antioxidants was found in the arthritic rats compared to the normol control rats (P<0.001). Administration of Aconitum ferox to the arthritic rats significantly increased the antioxidant profile compared to the model rats (P<0.0001).

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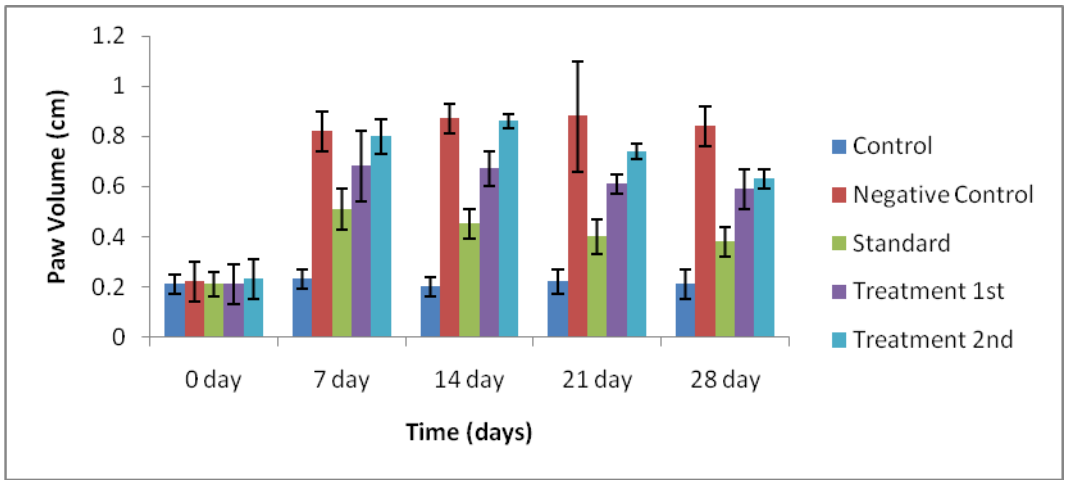

Fig. 3: Mean changes in paw volume

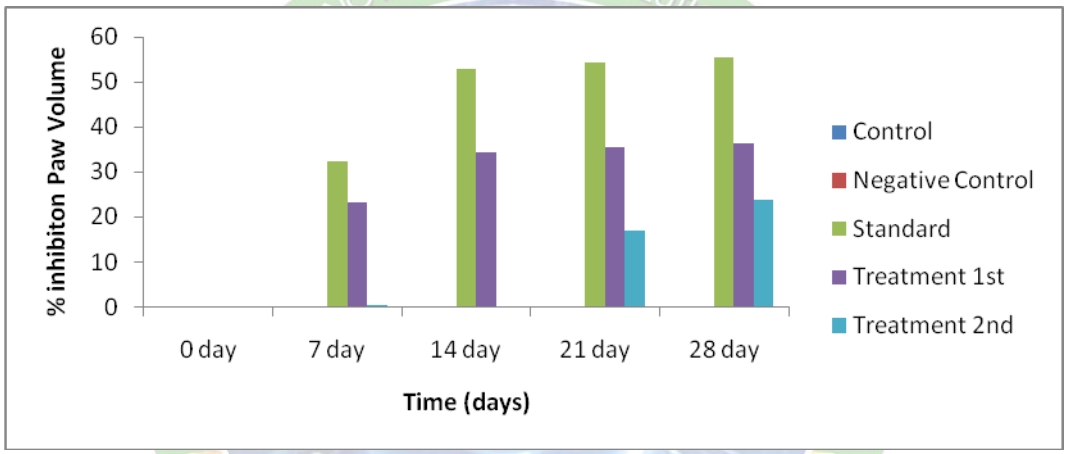

Fig. 4: Percentage inhibition of Paw Volume

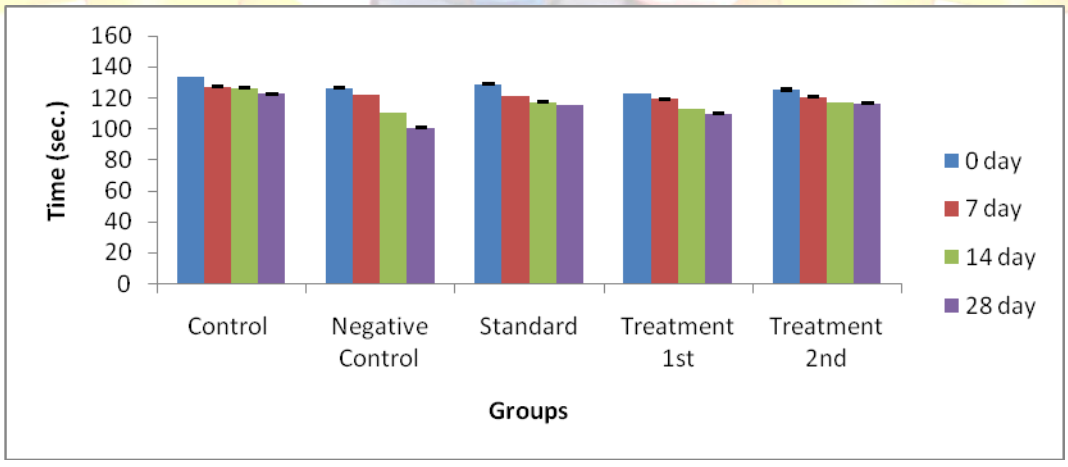

Fig. 5: Evaluation of Locomotor Activity

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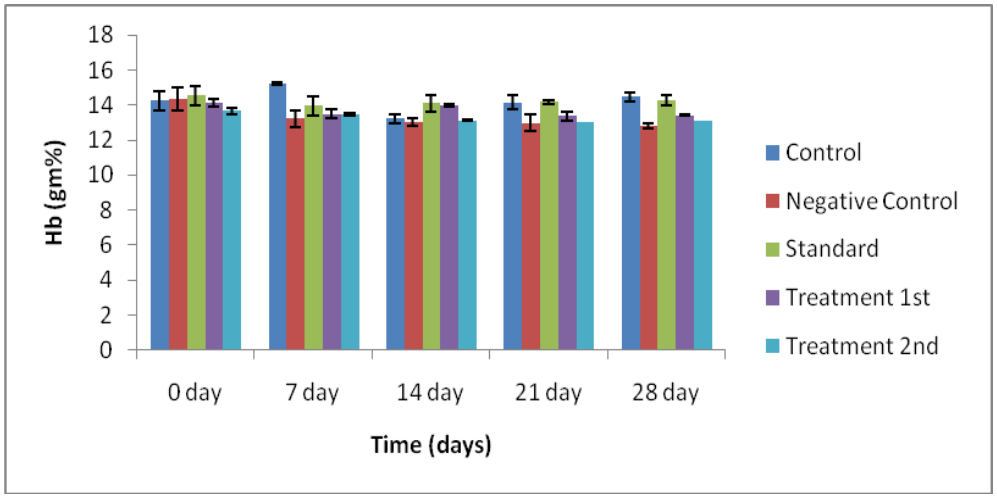

Fig.6: Hemoglobin content

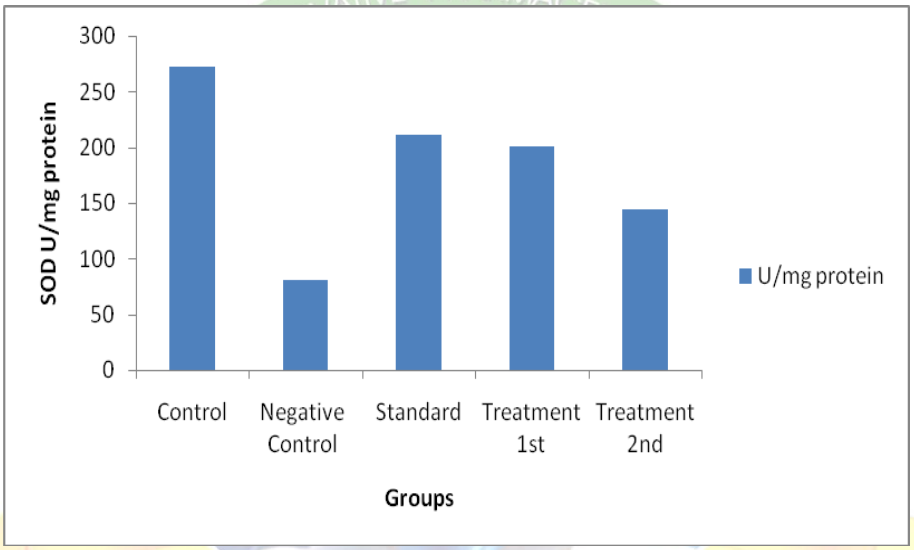

Fig.7: Estimation of Superoxide Dismutase Level

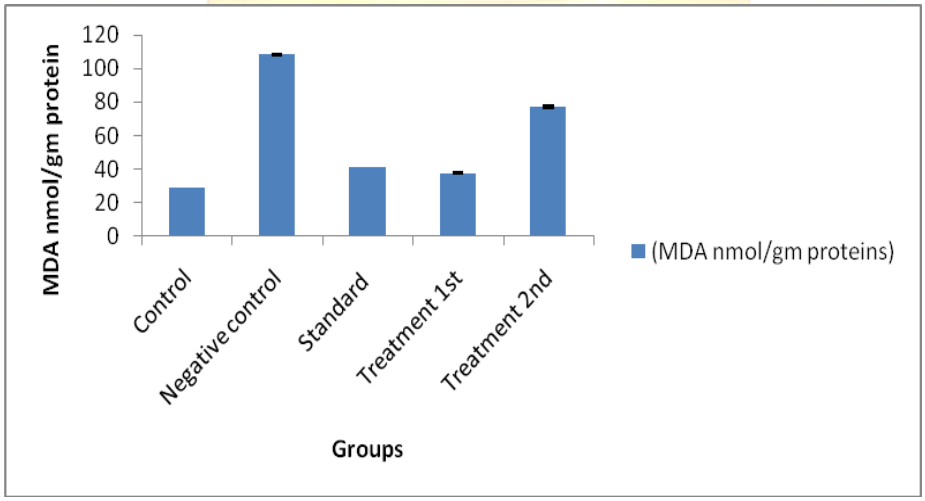

Fig.8: Estimation of Lipid Peroxidation level

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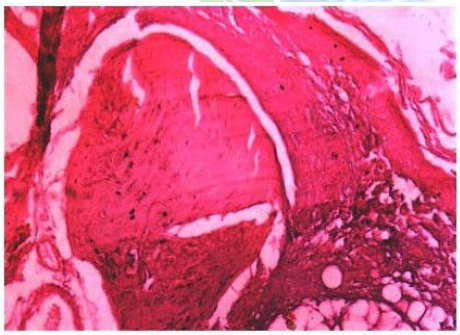
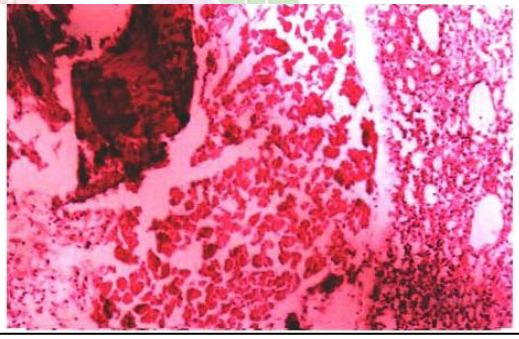
Histopathology of proximal interphalangeal joints on adjuvant induced arthritic rats

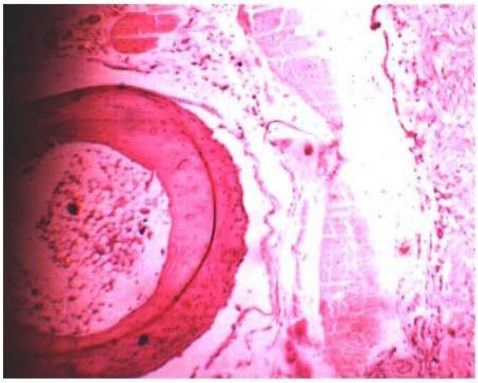
The observed histopathological changes of proximal interphalangeal joints of the experimental groups showed the histopathology of normal ankle joint. Group II the negative control arthritic rat joint showed prominent abnormalities from the normal joint like edema formation, degeneration with partial erosion of the cartilage, destruction of bone marrow and extensive infiltration of inflammatory exudates in the articular surface. The standard drug treated rat joint showed normal bone marrow with less cellular infiltrates. Aconitum ferox treatment for 28 days showed less inflammatory signs like scanty cellular infiltrate, absence of edema formation and normal bone marrow, whereas the Aconitum ferox treatment for 14 days showed cellular infiltrates on the articular surface with less cartilage destruction. The overall prevention of the inflammatory signs of the rat ankle joints was significant in 28 days drug treated group compared with 14 days drug treated group. Degeneration of the ankle joint was not observed in any of the drug treated groups when compared with the negative control.



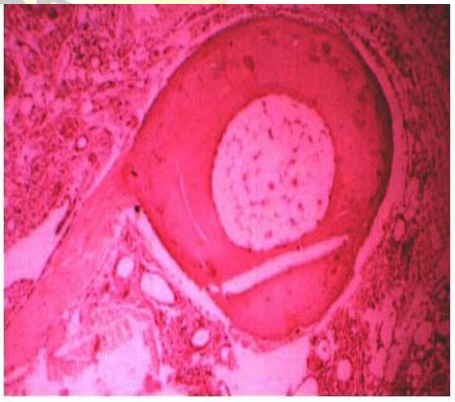
Normal Control: showed the histopathology of normal ankle joint normal articular cartilage and absence of infiltrate in the synovium.



Model control: negative control arthritic joint showed prominent abnormalities from the normal joint like edema formation, degeneration with partial erosion of the cartilage, destruction of bone marrow and extensive infiltration of inflammatory exudates in the articular surface.



Model rats treated by Diclofenac sodium 2 mg/kg- showed normal bone marrow with less cellular infiltrates.



Model rats treated by Aconitum ferox 10 mg/kg for 28 days as prophylactic treatment showed less inflammatory signs like scanty cellular infiltrate, absence of edema formation and normal bone marrow.

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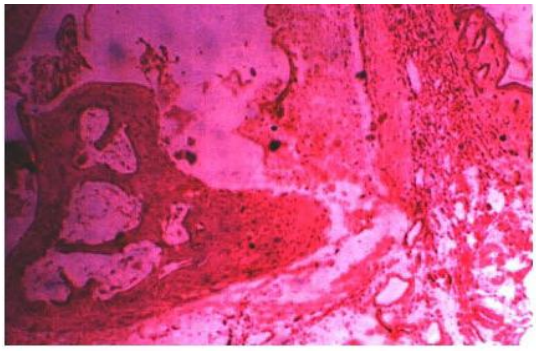
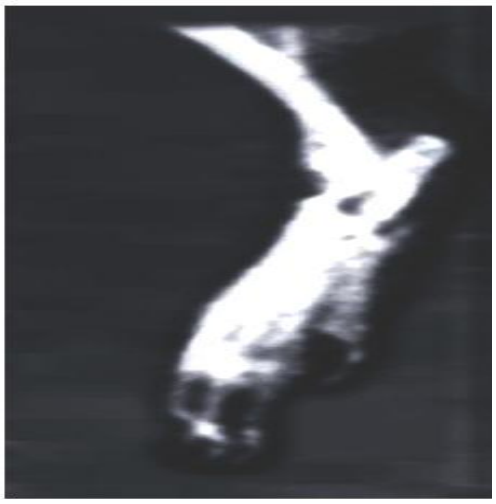
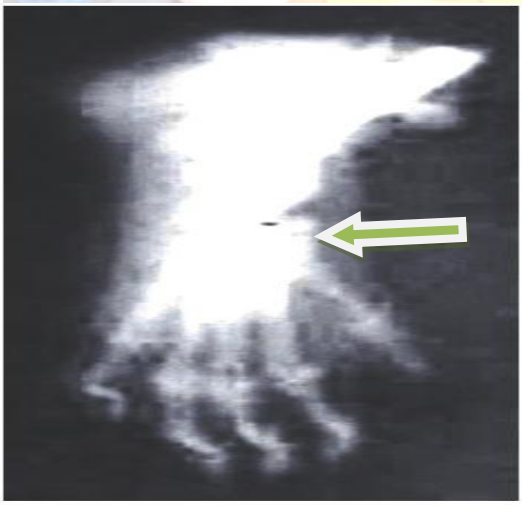


Model rats treated by Aconitum ferox10 mg/kg for 14 days as therapeutic treatment showed cellular infiltrates on the articular surface with less cartilage destruction.

Radiology of hind legs in adjuvant induced arthritic rats

Radiographic changes in RA conditions are useful diagnostic measures which indicate the severity of the disease. Soft tissue swelling is the earlier radiographic sign, whereas prominent radiographic changes like bony erosions and narrowing of joint spaces can be observed only in the developed stages (final stages) of arthritis. The radiographic features of the rat joints in adjuvant induced arthritic model are shown in fig. 13 In adjuvant induced arthritic rat (group II), soft tissue swelling along with narrowing of the joint spaces were observed which implies the bony destruction in arthritic condition. The standard drug Diclofenac sodium treated groups have prevented this bony destruction and also there is no swelling of the joint. Similar to histopathological studies, Aconitum ferox treatment for 28 days had shown better prevention against bony destruction by showing less soft tissue swelling and narrowing of joint spaces when compared with 14 days Aconitum ferox treated groups.





Normal Control: showed the Radiology of normal ankle joint.

Model control: negative control arthritic joint showed soft tissue swelling along with narrowing of the joint spaces were observed which implies the bony destruction in arthritic condition.

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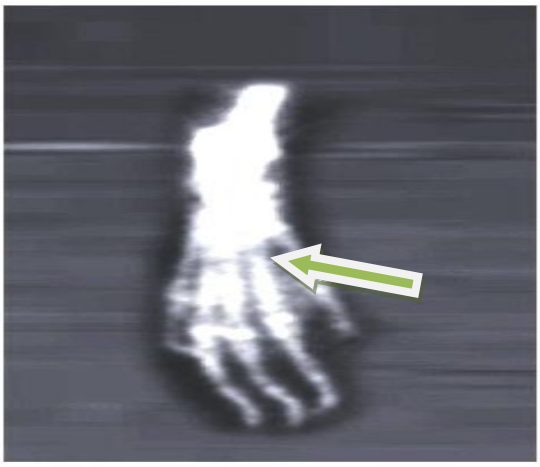
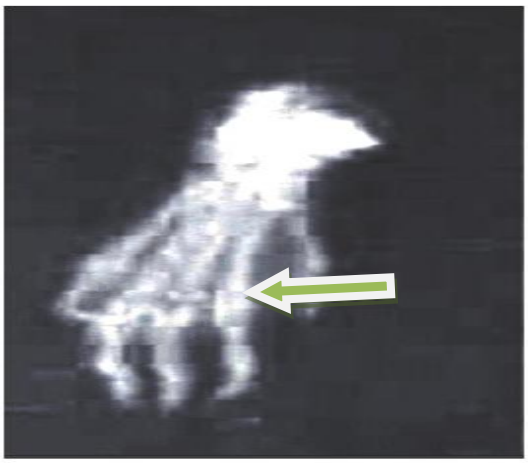
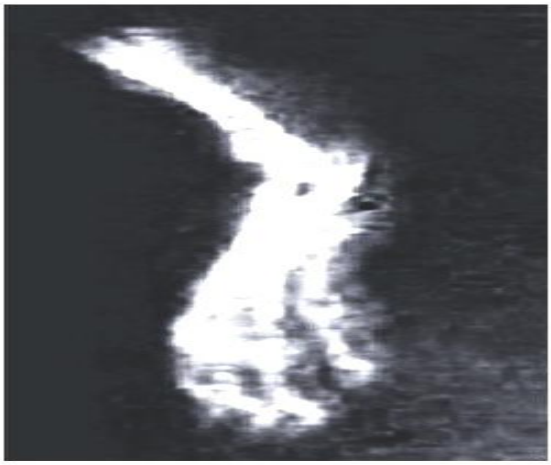


Model rats treated by Diclofenac sodium 2 mg/kg- the standard drug Diclofenac sodium treated groups have prevented this bony destruction and there is minor swelling of the joint.



Model rats treated by Aconitum ferox10 mg/kg for 28 days as prophylactic treatment- treated groups had no bony destruction and also there is little swelling of the joint.



Model rats treated by Aconitum ferox 10 mg/kg for 14 days as therapeutic treatment had shown little prevention against bony destruction by showing less soft tissue swelling and narrowing of joint spaces when compared with negative control group.

Over the last few decades, several clinical studies have been designed to examine the natural course of early RA, using validated measures, outside clinical trial settings [9]. This outcome was detected by studies with low and high quality. Thereof, several studies included subjects using anti-rheumatic drugs (DMARDs) which treat inflammations. Generally, medications should therefore indeed be noted as possible explanation for the reduction of pain perception over time [10]. But in the current review they were nevertheless not a very strong one because of some studies examining a whole sample taking medications inclusive the controls and in some other studies only less than half of the samples were treated. Both variants came to the

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same results that medications have no effect on the course of pain in RA [11]. The effect of pain reduction could possibly be explained by a coping effect. By paying attention and daily reporting the own pain intensity over a period of several weeks, people concerned could get a feeling of control over their complaints. This control perception could permit people to manage their disease-related problems. The experimental results of the study showed that Aconitum ferox root extract has an effective anti-arthritic activity against CFA-induced rheumatoid arthritis. The plant extract decreased the local area inflammation and reduce the immune system. Diclofenac can be used due to their immunosuppressant and short term healing properties. There are some studies which showed that Phenolic compounds, tannins and phenols also possess anti-arthritic activity. Phenolic compounds have attracted special attention due to their health-promoting characteristics. In the past ten years a large number of the studies have been carried out on the effects of Phenolic compounds on human health. Many studies have been carried out that strongly support the contribution of polyphenols to the prevention of cardiovascular diseases, cancer, osteoporosis, neurodegenerative diseases, and diabetes mellitus, and suggest a role in the prevention of arthritis. Tannins prevent arthritis development due to their protein precipitating and vasoconstriction effects. Their astringent action can help to precipitate micro-proteins on the arthritis site, thereby, forming an impervious layer over the lining, which hinders induced arthritis, as evidenced by the gut secretions, and protects the underlying mucosa from reduction in the arthritis. Flavonoids have been reported to act in the gastrointestinal tract, having antispasmodic, anti-secretory, antidiarrheal, antiulcer, and antioxidant properties. Another possible mechanism involves the antioxidant properties of rutin, which at a dose of 200 mg/kg has a protective effect against lesions induced by 50 % ethanol, probably by reducing the levels of lipoperoxides and increasing the activity of the antioxidant enzyme glutathione peroxidase [12]. It protects the joint of CFA induced arthritis The main mechanism of action for the inflammatory effects of this flavonol are its antioxidant properties, since oral pretreatment with quercetin (200 mg/kg) had protective effects in that it significantly reduced the severity of CFA induced arthritis by inhibition of lipid peroxidation, enhancement in the levels of mucosal non-protein SH compounds (important antioxidant agents) in GSH-Px and superoxide dismutase activities, as well as reduction of protein carbonyl compounds [13]. The antioxidant mechanism of action of flavonoids, especially garcinol, rutin and quercetin, is due mainly the presence in their structures of an o-dihydroxy in the B ring (catechol), and additionally a 2, 3 double bond in conjugation with a 4-oxo function, as well as the presence of hydroxyl groups in positions 3, 5 and 7 [14]. In Complete Freund's Adjuvant the control group which having six rat received

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Mycobacterium butyricum in paraffin oil (10 mg/ml), rat were shown physically weak condition on 10th day and their weight got decreased (15-20 gm).The ethanolic extract of Aconitum ferox showed better activity.

CONCLUSION

A comparative study on the extract of roots of *Aconitum ferox* for anti-arthritic effect was performed. The experiment had shown that roots possess anti-arthritic activity. From the above results, it can be inferred that, the ethanolic extracts of root showed marked anti-arthritic activity in Complete Freund's Adjuvant induced model. The dose of root extract was taken as 10 mg/kg, that was proved as safe and effective dose required for the activity. The data regarding model and activity has already been discussed in result. It can be concluded that the anti-arthritic activity is probably due to the presence of bioactive compounds like alkaloids, Phenolic compounds and tannins. Further studies are required to confirm the exact mechanism underlining the Arthritis and protecting property of the extract and to identify the chemical constituents responsible for it.

REFERENCES

1. Del R, I, Battafarano DF, Arroyo RA, Murphy FT, Fischbach M, Escalante A. Ethnic variation in the clinical manifestations of rheumatoid arthritis: role of HLA-DRB1 alleles. Arthritis Rheum 2003 Apr 15;49(2):200-8.
2. Eberhardt K, Fex E. Clinical course and remission rate in patients with early rheumatoid arthritis: relationship to outcome after 5 years. Br J Rheumatol 1998 Dec;37(12):1324-9.
3. Pulendran B., Palucka K., B anchereau J. Sensing pathogenesis and tanning immune responses. *Science*. 2001; 293: 253-256.
4. Rice JW., Veal JM., Fadden RP., Barabasz AF., Partridge JM., Barta TE., Dubois LG., Huang KH., Mabbett SR., Sillinski MA., Steed PM., Hall SE. Small molecule inhibitors of Hsp90 potently affect inflammatory disease pathways and exhibit activity in models of rheumatoid arthritis. *Arthritis & rheumatism*. 2008; 58: 3765-3775.
5. Feldmann M., Maini RN. Anti-TNF alpha therapy of rheumatoid arthritis: what have we learned.*Annu Rev Immunol*. 2001;19: 163-96.
6. Symmons DP, Barrett EM, Bankhead CR, Scott DG, Silman AJ. The incidence of rheumatoid arthritis in the United Kingdom: results from the Norfolk Arthritis Register. Br J Rheumatol 1994 Aug;33(8):735-9.
7. Mittal A., Sardana S., Panday A. Ethnobotanical, phytochemical and pharmacological profile of Jasminumsambac (L). Ait. *JPBMS*. 2011; 11: 2230-7885.Meenan RF, Kazis

DOI: 10.21276/IJIPSR.2018.06.04.688

LE, Anderson JJ. The stability of health status in rheumatoid arthritis: a five-year study of patients with established disease. Am J Public Health 1988 Nov;78(11):1484-7.

8. ChoudharyManjusha et al. Medicinal plants with potential antiarthriticactivity. Journal of Intercultural Ethnopharmacology. 2015; 4(2): 141-179.

9. Rupasinghe VHP., Clegg S. Total antioxidant capacity, total phenolic content, mineral elements, and histamine concentration in wines of different sources. *JFCA.*2007; 20: 133-137.

10. Geboes L., De Klerck B., Van Balen M., Kelchtermansti., Mitera T., Boon L., De Wolf., Peeters C., Matthys P. Freund's complete arthritis in mice lacking a functional interferon gamma receptor by triggering tumour necrosis factors alpha-driven osteoclastogenesis. *Arthritis Rheum*. 2007; 56: 2595-607.

11. Billiau A., Matthys P. Modes of action of freund's adjuvants in experimental models of autoimmune diseases. *J LeuKoc Biol*. 2001; 70: 849-60.

12. Babbar N., Casero R. Tumor necrosis factor-alpha increasres reactive oxygen species by inducing spermine oxidase in human lung epithelial cells: a potential mechanism for inflammation-induced carcinogenesis. *Cancer Res*. 2006; 66: 11125-11130.

13. Yudoh K., Karasawa R., Masuko K., Kato Tamohiro. Water-soluble fullerene (C60) inhibits the development of arthritis in the rat model of arthritis. *IJNM*. 2009; 4: 217-225.

14. Nagai N., Fukuhata T., Ito Y., Tai H., Hataguchi Y., Nakagawa K. Preventive effect of co-administration of water containing magnesium ion on indomethacin induced lesions of gastric mucosa in adjuvant induced arthritis rat. *BPB*. 2009; 32: 116–120.