



## Investigation of Arthritis Suppressing Potency of *Chloris Paraguaiensis* on Freund's Adjuvant Induced Arthritis in Rats

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### ABSTRACT

Arthritis is a widespread disorder that occurs in elderly patients currently in the world. It is one of those disorders that affect the joints and is classified as an inflammatory disorder that is a result of immune system malfunctioning. Taking into consideration the side effects of immune suppressants that are used to treat arthritis; generally, plants are being investigated for the chemical constituents to treat the diseases. It is proved that moieties obtained from herbal sources are relatively safer and potent too. The economical methods of treating illness are using plants, and so the herbs are investigated for the treatment of arthritis. *Chloris paraguaiensis* Steud., is one of the members of grass family which is grown wild in tropical countries all around the world. It usually grows like a weed and can be employed for many pharmacological problems. Traditional claims are there to treat DM, Rheumatism and diarrhoea. Chemical constituents like flavonoids, tannins and phenols have been isolated from the plant earlier. *Chloris* was selected as a subject to investigate its anti-arthritis potential in vivo using experimental animals following the folklore claims that the plant can be used to treat arthritis. It may be due to the presence of flavonoids and polyphenol-rich chemical constituents in the plant. The exact mechanism of action is to be established and the extracts in this current study showed a significantly comparable activity with that of the standard drug indomethacin.



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### INTRODUCTION

Arthritis is a widespread disorder that occurs in elderly patients currently in the world. It is one of those disorders that affect the joints and is classified as an inflammatory disorder that is a result of immune system malfunctioning. The disease leads to the damage of the cartilage in the joints leading to the ankylosing joints. It can also be the cause for other disorders like pleuritis, scleritis characterized by nodular lesions and is commonly seen in subcutaneous tissue. Even though the origins of the diseases are not known clearly, immune problems play a significant role in determining the prognosis of the disease (Jain *et al.*, 2011).

In the world currently, more than six crore peo-

**Table 1: Changes in the body weights of rats due to ethanolic extract of whole plant of *Chloris paraguayensis* Steud**

Group	Body Weight (gms)			
	Initial	1st week	2nd week	3rd week
Control Group	189.23 + 8.07	192.42+8.09	195.21+ 7.52	198.54+6.36
Inducing agent	164.89+ 9.76	151.28+5.11	155.73+ 6.48	156.56+ 7.01
Standard drug	187.02+ 7.31	183.54+7.36	186.67+ 5.35	195.72+ 5.29
CEE-250mg/kg	194.45+5.025	186.89+4.672	190.92+4.521	191.34+4.654
CEE-500mg/kg	161.67+4.928	157.92+3.045	159.14+3.496	168.57+3.278

**Table 2: Changes in the Paw Volumes of rats due to ethanolic extract of whole plant of *Chloris paraguayensis* Steud**

Group	Paw Volume				% Inhibition
	0 week	1stweek	2ndweek	3rd week	
Control Group	0.218+0.1442	0.229+0.0136	0.212+0.0149	0.216+0.0127	—
Inducing agent	0.234+0.1767		0.786+0.0253**	0.708+0.0190**	—
Standard drug	0.296+0.0278	0.585+0.0483**	0.465+0.0382**	0.402+0.0378**	57.28
CEE-250mg/kg	0.253+0.0341	0.702+0.0295**	0.598+0.0423**	0.516+0.0412**	43.63
CEE-500mg/kg	0.240+0.0182	0.73+0.0174**	0.532+0.0387**	0.491+0.0239**	46.25

ple are affected by arthritis. Generally, women are affected by 3 times more than men. The average age group of the population are affected mostly by arthritis. The age is between 35-55, and other ages are being affected too. There is some marker that is used to evaluate the disease extend and spread the synovial study can determine that. Still, in the lab, experimental rats were used to study the activity invivo accurately.

Taking into consideration the side effects of immune suppressants that are used to treat arthritis generally, plants are being investigated for the chemical constituents to treat the diseases. It is proved that moieties obtained from herbal sources are relatively safer and potent too. The cheapest methods of treating the disease are using plants and so the herbs are investigated for the treatment of arthritis (Shidamallayya *et al.*, 2010).

*Chloris paraguayensis* Steud, is one of the members of grass family which is grown wildly in tropical countries all around the world. It usually grows like a weed and can be employed for many pharmacological problems. Traditional claims are there to treat DM, Rheumatism and diarrhoea. Chemical constituents like flavonoids, tannins and phenols have been isolated from the plant earlier. CNS stimulants like caffeine and theobromine are also isolated from the plant (Burris *et al.*, 2012). So in this current research, the antiarthritic activity of the plant as investigated invivo using laboratory rats.

## MATERIALS

### Plant Material

Whole plants of *Chloris* were collected in the month of November 2019 and they are shade dried for five days. The plants were duly authenticated and the herbarium specimen is left in the college library. The dried powder is finely ground and extracted with ethanol using a cold maceration method for two days. The extract was filtered and evaporated using a rotary evaporator and stored using a desiccator. The percentage yield was calculated as 15.4%w/w and noted as (CEE).

Experimental animals used for the investigation are albino Wistar rats which weighed 130-170gm and were acclimatized for 2 days before the experiments. They were let free access to food and water. The experiments were performed on the rats were approved and as per the animal ethics committee permission.

### Arthritic Activity

The anti-arthritic activity was performed by the procedure prescribed by Freund's Adjuvant method in rats (Lokesh *et al.*, 2010). The animals were divided into five groups of 5 animals in each group.

The groups planning is according to the below protocol

Group I: Normal Control Group-given with only CMC solution at 1% solution.

**Table 3: Changes in the blood cell parametres due to ethanolic extract of whole plant of Chloris paraguaiensis Steud**

Group	RBC (106 cells/mm <sup>3</sup> )	WBC (103 cells/mm <sup>3</sup> )	Hb (gm %)	ESR (mm/hr)
Control Group	7.03 + 0.082	8.05+ 0.041	16.82 + 0.045	4.22±0.096
Inducing agent	6.42+0.491**	10.23+0.057**	11.21+0.056**	7.84+0.152**
Standard drug	7.26±0.054**	8.52+0.128**	14.04+0.078**	5.31+0.104**
CEE-250mg/kg	6.37±0.068**	9.47+0.125**	12.33+0.071**	6.86+0.149**
CEE-500mg/kg	8.06+0.085**	8.89±0.074**	13.06+0.182**	5.25+0.063**

**Table 4: Changes in the Serum parametres due to ethanolic extract of whole plant of Chloris paraguaiensis Steud**

Group	SGOT (IU/L)	SGPT (IU/L)	ALP (IU/L)
Control Group	59.72+ 4.132	47.82+2.814	174.42+3.673
Inducing agent	103.81+2.354**	91.61+2.254**	198.65+3.781**
Standard drug	74.64+2.247**	62.92+2.468**	181.20+2.619*
CEE-250mg/kg	79.05+2.126**	70.74+3.410**	193.36+3.245**
CEE-500mg/kg	86.67+2.469**	66.83+2.956**	187.93+4.926**

Freund's Adjuvant (Difco-mycobacterim strain of bacteria suspended in paraffin at concentration of 5mg/ml) was administered in the sub plantar region during the initial stage of the experiment

Group II: Positive Control Group: Freund's adjuvant was administered with just CMC solution.

Group III: Negative Control group: Freund's adjuvant was administered with Indomethacin as a standard drug at a dose of 10mg/kg body weight (Pathak *et al.*, 2009).

Group IV: Extract doses CEE 250mg/kg body weight with Freund's adjuvant was administered.

Group V: Extract doses CEE 500mg/kg body weight with Freund's adjuvant was administered.

The weights were noted in regular intervals before and after the start of the experiment. The paw volumes were noted on the last day of the experiment and compared with the initial volume and normal control. Blood was withdrawn ethically from rats as per procedure and was subjected to centrifugation. The cellular blood parameters like RBC, WBC Hb and ESR were estimated. The serum constituents like SGOT, SGPT and ALP were also estimated.

## RESULTS AND DISCUSSION

The data corresponding to the antiarthritic activity of Chloris has been portrayed in the tables. The weight gain was also noted in regular intervals and there no significant change in the weights in the extract-treated groups (Table 1). So in fact,

the weights did not influence the arthritis and the extracts facilitated the reduction of weights due to its anti-lipidemic property (Snehalatha *et al.*, 2013); (Schurgers *et al.*, 2011).

The paw volumes noted are in (Table 2). There was a significant change in the volume of the paw as inflammation was induced by the bacterial strain which was similar to the arthritis features in human beings. So it was used as the model in this investigation. The extracts showed a dose-dependent antiarthritic activity at 250mg/kg and 500mg/kg, which is significant when compared to the standard drugs indomethacin. The percentage inhibition was also nearer to the standard drug with 45% inhibition. The activity helped in the normalization or prevention of joint deformation in the body due to the induction agent (Pramod *et al.*, 2012).

Cellular constituents of the blood like RBC gives us an indication of the level of inflammation in the body. It was lowered with the induction of arthritis using mycobacterium and was significantly elevated with standard drug and extracts at 500mg/kg, which was comparable. It was similar in case of WBC, Hb and ESR also. The serum parameters like SGOT, SGPT and ALP were also elevated in the induction of arthritis (Table 3). It indicates that there was a serious inflammatory response in the body with the bacteria. The biomarkers used in the study displayed the values that are similar to the standard drug indomethacin Sutradhar *et al.* (2006). The indomethacin drug, and the extracts helped in lowering those values to a considerably low level which

also in a dose based manner (Chillingworth and Donaldson, 2003); (Liu et al., 2009).

Overall it can be said that the extracts showed a better anti-arthritic activity compared to the standard drug indomethacin, which proves the traditional claims of the plant to treat rheumatism (Table 4).

## CONCLUSIONS

Cloris was selected as a subject to investigate its anti-arthritis potential in vivo using experimental animals following the folklore claims that the plant can be used to treat arthritis. It may be due to the presence of flavonoids and polyphenol-rich chemical constituents in the plant. The exact mechanism of action is to be established and the extracts in this current study showed a significantly comparable activity with that of the standard drug indomethacin.

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## Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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