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RESEARCH ARTICLE
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UNVEILING THE THERAPEUTIC POTENTIAL OF *CORIANDRUM SATIVUM* LEAVES: ANTIDIABETIC, ANTIPYRETIC, AND ANTIMICROBIAL INSIGHTS

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Abstract

The present study was designed to investigate and establish the folklore uses of *Coriandrum sativum* (Linn) as antidiabetic, antipyretic and antimicrobial agent. The antidiabetic activity of methanolic extract of *Coriandrum sativum* was studied in alloxan induced diabetic rats at the doses of 200 and 400mg/kg body weight for the period of 21 days and its effect on blood– glucose, serum insulin and lipid profile was estimated during the study.

Paracetamol (150mg/kg body weight by oral) was used as reference drug and control group received 2% Tween 80. Rectal temperatures of all rats were recorded and compared at 19h immediately before extract or paracetamol or vehicle administration and again at 1 h interval up to 23 h. The CSLE (200 and 400mg/kg by oral) showed significant and dose dependent reduction in pyrexia. The extract had shown a significant dose dependent antipyreic effect comparable with standard drug paracetamol.

The extract was found to possess a significant antibacterial effect against Gram -ve (E.coli, *Shigella spp, Vibrio spp*) appeared to be most susceptible to CSLE than the gram positive (*Bacillus spp, S. aureus*) organisms. The minimum inhibitory concentration (m.i.c) and zone of inhibition (in mm) was determined by checker board technique and disc diffusion technique respectively.

The extract was found to possess a significant antifungal effect against various strains of *Candida*. It was found that *Candida albicans ATCC-10231* and *Candida albicans 5* were completely inhibited at 200 µg/ml. Inhibition of growth of *Penicillin notatum* started at 100 µg/ml and was completely inhibited at 400 µg/ml.

Introduction

Herbal medicinal products have long been utilized for their therapeutic benefits, with the World Health Organization (WHO) estimating that 80% of the global population relies on herbal medicine for primary healthcare (Farnsworth et al., 1976). The rising demand for these natural remedies has necessitated stringent measures to ensure their quality and purity in accordance with internationally recognized guidelines (Mukherjee et al., 1998). Notably, the collection of medicinal plants from the wild generates approximately 40 million man-days of employment (Tiwari, 2000), further emphasizing their economic significance. As the sales of herbal supplements continue to surge, their role in managing chronic diseases such as diabetes mellitus has garnered significant attention (Verma et al., 2011). Diabetes is a major global health concern, ranking among the top causes of death due to

its fatal complications, including retinopathy, nephropathy, neuropathy, and angiopathy (Kristova et al., 2008; Trivedi et al., 2004). It results from the absence or insufficient production of insulin, leading to hyperglycemia (Kgmm and Zimmet, 1998), with hormonal imbalances further exacerbating the condition (Grant RW et al., 2009). Genetic susceptibility plays a crucial role in the progression of this autoimmune disorder (Waugh and Grant, 2003). If left untreated, diabetic ketoacidosis (DKA) can lead to coma or death, making proper insulin management critical (Gallwitz, 2006; Mitchell et al., 2001). Additionally, type 2 diabetes is often linked to insulin resistance syndrome, necessitating comprehensive treatment strategies, including insulin therapy when required (David et al., 2011; Bennett et al., 2011). Beyond diabetes, temperature regulation is also crucial in human physiology, with warm receptors optimally responding at approximately 45°C (Darian-Smith et al., 1977). Conventional antipyretic drugs, though effective, often cause gastrointestinal side effects due to COX-1 inhibition (Stefferl et al., 1996), reinforcing the need for natural alternatives with minimal toxicity (Shah and Seth, 2010). Similarly, the escalating bacterial resistance to existing drugs remains a pressing concern, urging continuous research into novel antimicrobial agents (Essawi et al., 2000; Woodford, 2003). Alarmingly, recent studies indicate that 25% of bacterial pneumonia cases exhibit penicillin resistance, with an additional 25% showing resistance to multiple antibiotics (Todar, 2008; Lowy, 2003). Microbial survival mechanisms, such as genetic adaptations in response to antimicrobial exposure, further complicate treatment strategies (Mathew et al., 2007). Therefore, the exploration of herbal medicines as potential antidiabetic, antipyretic, and antimicrobial agents presents a promising avenue for future research and therapeutic advancements.

PLANT MATERIAL:

The leaves of *Coriandrum sativum (Linn)* were collected from Greater Noida, during November 2012. The plant was authenticated and identified by Dr. K.C Bhatt (Senior scientist),NBPGR,Pusa Campus,New Delhi and a voucherspecimen(NHCP/NBPGR/2013-52) is preserved in our laboratory for future reference . Leaves were shade dried, coarsely powdered, passed through 40 mesh sieve and stored in air tight container.

EXTRACTION OF PLANT MATERIAL:

The plant material was extracted in soxhlet apparatusand the percentage yield calculated by the following formula was found to be 12.5 % w/w.

$$\text{Percentage yield} = \frac{\text{wt of extract - wt of empty china dish} \times 100}{\text{wt of powdered drug}}$$

PHYTOCHEMICAL INVESTIGATION:

The result of phytochemical investigation are as follow:

Table 1 Result of phytochemical investigation:

Phytoconstituents	**Solvents**				
	Methanol	**Water**	**Petroleum ether**	**Benzene**	**Chloroform**
Tannin	+	-	-	+	+
Alkaloid	+	+	+	-	+
Carbohydrate	+	+	-	-	-
Proteins and amino acids	+	-	-	_	-
Saponin	+	+	-	-	-
Glycoside	+	+	+	-	-
Phytosterols	+	+	-	-	+
Phenol	-	-	+	-	+

Key: ++ means abundant; + Indicates presence; - indicates absence;

It is evident from the results of phytochemical investigation that solvent methanol exhibits the presence of maximum number of phytocontituents. Water comes next depicting presence of same constituents as that of methanol except tannin, phenol and. Proteins. Petroleum ether showed presence of alkaloids, glycosides and phenol. Tannin, alkaloids, phytosterols and phenol were present in chloroform. For these analysis methanol is used as a solvent because it contains maximum number of phytoconstituents like tannin, alkaloid, carbohydrate, glycosides etc.

ANTIDIABETIC ACTIVITY:

The Antidiabetic potentiality of leaves of *Coriandrum sativum* was evaluated by Alloxan induced diabetic model.

Table 2 : Effect Of CSLE On Blood Glucose Level In Alloxan Induced Diabetic Rats (21 Days Study).

Treatment	Blood Glucose level (mg/dl)			
	0 day	**7th day**	**14th day**	**21st day**
Normal Control	100.534±3.64	100.70±3.49	96.65±2.068	97.52±1.45
Diabetic control (120mg/kg)	253.93±3.86	256.30±5.38*	264.11±6.726*	271.37±2.62*
Glibenclamide (2.5 mg/kg)	251.54±5.06	102.26±3.11**	96.88±2.628**	86.99±1.28**
CSLE(200mg/kg)	251.42±4.25	194.48±4.98**	185.92±3.105**	172.92±5.43**
CSLE(400mg/kg)	248.72±3.80	187.17±4.29**	166.32±1.236**	142.55±2.29**

SEM= Standard Error Mean , All the values are taken as a mean of six animals and expressed as Mean± SEM , when *p< 0.01 significant, **p <0.001 highly significant.

CSLE=*Coriandrum Sativum* Leaf Extract

The perusal of data revealed that the methanolic extract of the leaves of *Coriandrum sativum* decreased the blood glucose level statistically significant (Table.2) when compared with diabetic control. The 400 mg/kg body weight dose was found better than 200 mg/kg body weight however, the standard Glibenclamide was better in comparison to both doses.

Table 3: Effect of CSLE on body weight in alloxan induced diabetic rats (21day study).

Treatment	**0 day**	**7th day**	**14th day**	**21st day**
Normal control	202.40±2.74	204±2.77	205.59±2.79	210.12±2.85
Diabetic control (120mg/kg)	202.90.±2.88	173±2.58**	160±2.52**	146±1.71**
Glibenclamide (2.5 mg/kg)	205.92±2.83	203±2.62	197±2.02	191±1.87**
CSLE (200mg/kg)	205±2.38	198±2.13	192±1.87	182.5±1.20**
CSLE (400mg/kg)	206±2.43	199±2.06*	194±1.68*	186±1.48**

SEM= Standard Error Mean ,All the Values are expressed as Mean ±SEM (n=6) ,when *p≤ 0.05 significant, **p ≤ 0.01 highly significant.

Table 4: Effect of CSLE on biochemical parameters measured in alloxan induced diabetic rats (21day study).

Treatmnt	Total cholesterol (mg/dl)	LDL (mg/dl)	HDL (mg/dl)	VLDL (mg/dl)	Triglycerides(mg/dl)	SGOT (IU/L)	SGPT (IU/L)
Nomal control	63.16± 1.52	19.97± 0.86	27.52± 1.14	12.67± 0.74	63.35± 1.34	15.1± 2.3	13.40± 2.50
Diabetic control	231.26± 5.48	160.47 ±4.89	48.55± 2.43	32.24± 1.25*	161.20± 4.67*	49.80± 1.69	27.8± 9.35
Standad (Glibenclamide)	89.49± 2.63*	35.5± 1.21*	46.67± 1.15*	16.32± 0.87*	81.6± 3.29**	15.3± 2.34**	15.3± 1.34
CSLE (200mg/kg)	111.42± 3.15*	49.73± 1.44*	35.15± 1.67*	20.54± 0.85**	102.7±3 .15**	29.1± 8.6	22.1± 1.84
CSLE (400mg/kg)	98.71± 2.14*	35.54± 1.46*	43.67± 2.18*	17.3± 0.61**	93.4± 2.68**	18.4± 1.96**	13.2± 1.47**

SEM= Standard Error Mean ,All the Values are expressed as Mean ±SEM (n=6) ,when *p< 0.001 significant, **p< 0.01 highly significant.

The administration of alloxan increased the various serum lipid . Treatment with alloxan decreased the lipid parameters such as total cholesterol, LDL, HDL, VLDL, and triglycerides which was statistically significant when compared with diabetic control(Table 4.4). SGOT and SGPT, found to be dose dependent and were reduced at higher doses of extract. The above findings justified the antidiabetic activity of the leaves of *Coriandrum sativum* which proved the traditional claim of antidiabetic activity of the methanolic extract.

ANTIPYRETIC ACTIVITY:

The observation of antipyretic activity of methanolic extract of *Coriandrum sativum* leaves against yeast induced hyperthermia is summarized in table 4.5 as follows:

Table 5 Effect of CSLE on yeast induced pyrexia in rats:

Treatment	Rectal temperature(°C) (mean SEM) after yeast administration at					
	0h	**19h**	**20h**	**21h**	**22h**	**23h**
Control (5ml/kg)	**37.5±0.1**	**39.7±0.4**	**39.5±0.2**	**39.3±0.3**	**39.3±0.2**	**39.1±0.3**
Paracetamol (150mg/kg)	**37.7±0.3***	**39.7±0.4***	**38.0±0.1***	**37.7±0.2***	**37.5±0.1***	**37.2±0.2***
CSLE (200mg/kg)	**37.6±0.3***	**39.6±0.5***	**38.8±0.7***	**38.5±0.3***	**38.4±0.1***	**37.8±0.1***
CSLE(400 mg /kg)	**37.2±0.2***	**39.8±0.4***	**38.4±0.1***	**38.2±0.5***	**37.9±0.3***	**37.8±0.3***

The mean value ± SEM was calculated for each parameter, Results were statistically analyzed by ANNOVA followed by Dunnet's t- test. *P< 0.01 was considered significant. , CSLE=*Coriandrum sativum* leaf Extract

The subcutaneous brewer's yeast injection to rat markedly elevated the rectal temperature after 19 h of challenge. The treatment with CSLE at doses of 200 and 400 mg/kg body wt. decreased the rectal temperature of the rats in a dose dependent manner. Paracetamol at the dose of 150 mg/kg , p.o. significantly decreased in rectal temperature at 2 and 3 h after administration. The antipyretic effect

started as early 1 h and the effect was maintained for 4 h, after its administration. It was found that CSLE at doses of 200 and 400 mg/kg body wt. caused significant (p<o.o1) lowering of body temperature up to 5 h after administration.The 200 and 400 mg/kg body wt doses of the extract as well as Paracetamol (150 mg/kg) produced significant reduction in rectal temperatures at 21h, 22h, 23h after induction of pyrexia.

The present results show that the methanolic *Coriandrum sativum* leaf extract (CSLE) posess a significant antipyretic effect in yeast- provoked elevation of body temperature in rats, and its effect is comparable to that of Paracetamol (standard drug).

***In vitro* Antimicrobial activity:**

Antibacterial activity:

The result in Table depicted the MIC values of the methanolic extract of the leaves of *Coriandrum sativum* against various tested bacterial pathogens.

Table 6 : Determination of MIC of methanolic extract of Leaves of *Coriandrum sativum* against various bacterial strains:

S.No	Name of microorganism	Dilution of methanolic Leaves extract (µg/mL) in nutrient agar media						
		0	5	25	50	100	200	400
1	*Vibrio cholera 575*	+	+	±	+	+	+	_
2	*Vibrio cholera 1033*	+	+	+	+	±	+	-
3	*Vibrio cholera 426*	+	+	+	+	±	+	-
4	*Vibrio chole765*	+	+	_	_	_	_	_
5	*Vibrio cholera 1023*	+	+	+	+	_	_	_
6	*Vibrio cholera 1311*	+	+	+	+	+	+	+
7	*Vibrio cholera BDI/81*	+	+	+	+	+	+	_
8	*Shigella soneii NK29*	+	+	+	+	+	+	+
9	*Shigella soneii F11001*	+	+	+	+	+	-	-
10	*Shigella dysenteriae 1*	+	+	+	+	+	+	-
11	*Shigella boydii 22461*	+	+	+	+	+	-	-
12	*Shigella flexneri type 36 NK 381*	+	-	-	-	_	_	-
13	*Escherichia coli 306*	+	+	+	+	+	-	-
14	*Escherichia coli 798*	+	+	+	+	+	+	-
25	*Escherichia coli 358*	+	+	+	+	-	-	-
16	*Escherichia coli 18/9*	+	-	-	-	-	-	-
17	*Actinobactor spp*	+	+	+	+	+	+	+
18	*Protious vulgaris AP769 NLF*	+	+	+	+	+	+	+
19	*Klebsiella pneumoninae*	+	+	+	+	-	-	-
20	*Salmonellatyphii type II*	+	+	+	+	+	+	-
21	*Staphylococcus aureus 381*	+	+	±	±	±	_	+
22	*Bacillus cereus MTCC 1305*	+	+	+	+	+	_	_
23	*Bacillus subtilis MTCC 441*	+	+	+	+	_	_	_
24	*Pseudomonas aeruginosa AP585 NLF*	+	+	+	+	_	_	_

25	*Pseudomonas putida MTCC 2252*	+	+	+	+	+	+	–

0= control, ± Inhibited Growth, + Growth, - Absence of Growth

The most sensitive strains of different genera were selected for the disc diffusion study.The result of determination of zone of inhibition of the crude extract of the leaf plant and comparison with standard antibacterial agent ciprofloxacin against the bacterial strains is recorded in table 4.7

Table 4.7: Determination of diameter of zone of inhibition (mm) produced by the methanolic extract of the leaves of *Coriandrum sativum* and its comparison with Ciprofloxacin against selected sensitive bacterial strains.

		Diameter of zone of inhibition in mm against various doses			
S.No.	**Name of bacteria**	**Extract (µg/mL)**		**Ciprofloxacin (µg/mL)**	
		400	**800**	**400**	**800**
1	*Vibrio cholera* 765	10	11	25	28
2	*Vibrio cholera* 1023	9	11	19	24
3	*Pseudomonas aeruginosa*	10	12	18	21
4	*Shigella flexneri* type 36 NK 381	15	19	25	28
5	*Klebsiella pneumoninae*	11	15	19	24
6	*E.coli 358*	7	10	20	24
7	*E.coli 18/9*	10	12	25	26
8	*B.subtilis* MTCC 441	9	10	20	25
9	*Staphylococcus aureus 381*	10	12	21	26

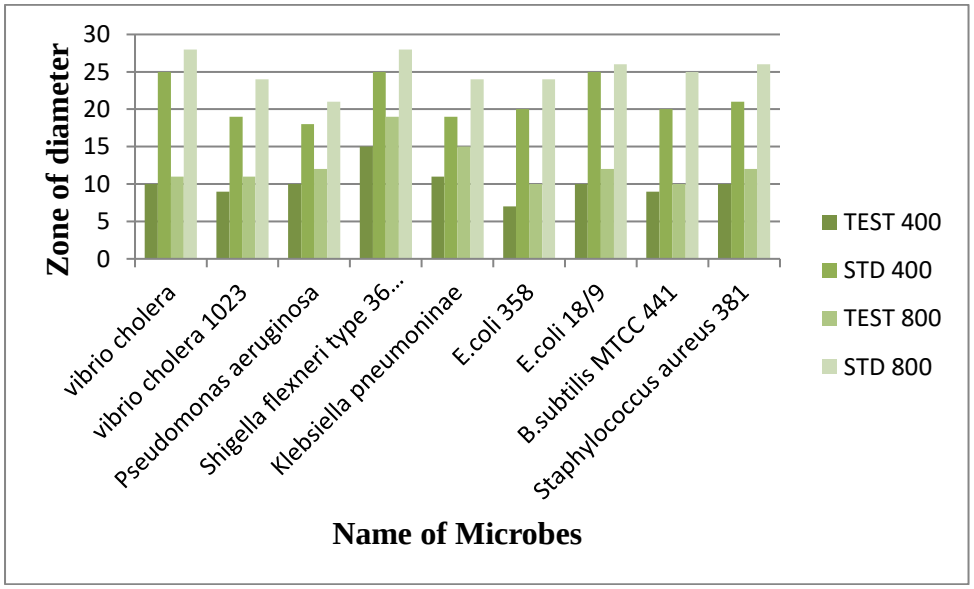

Fig: 1: Graphical representation of antibacterial activity of CSLE and its comparison with Ciprofloxacin against selected sensitive bacterial strains.

The strains for disc diffusion study were selected on the basis of their results of MIC. The sensitive strains were tested for the disc diffusion analysis as shown in Table 6 .The result of determination of zone of inhibition of the leaves of *Coriandrum sativum* and its comparison with standard antibacterial agent ciprofloxacin against the bacterial strains is recorded in the above Table 4.7

The *in vitro* antibacterial activity of methanolic extract of the leaves of *Coriandrum sativum* was studied against Gram -ve (E.coli, *Shigella spp, Vibrio spp*) appeared to be most susceptible to CSLE than the gram positive (*Bacillus spp, S. aureus*) organisms.
All the strains of E.coli spp.were found to be inhibited maximum by CSLE. *E.coli 18/9* was inhibited at the least CSLE concentration (10 µg/ml) and found to show maximum zone of inhibition (12 mm) at largest tested concentration (800µg/ml) comparable to Ciprofloxacin.
Potent inhibitory activity was also noted against various strains of shigella spp. CSLE at 10 µg/ml inhibited the *Shigella flexneri* type 36 NK 381 , and other spp inhibited at CSLE 200- 400 µg/ml.
Potent inhibitory activity was also noted against various strains of Vibrio spp. CSLE at 100 ug/ml inhibited the growth of *Vibrio cholera* 765 and *Vibrio cholera* 1023 .
Various strains of Bacillus spp and S.aureus spp inhibited the growth at 200- 400 µg/ml.

An evident from the results, the methanolic CSLE have more pronounced effect against gram negative bacteria (E.coli, Shigella spp, Vibrio spp) and moderate inhibitory action against Gram positive bacteria . The disc diffusion method employed for assay of antibacterial activity revealed that CSLE has antibacterial potentiality comparable to standard drug Ciprofloxacin especially against Gram negative bacteria . Gram negative bacteria have a phospholipid membrane carrying the structural lipopolysaccharide component which makes their cell wall impermeable to antimicrobial substances, thus rendering them more resistant to antibiotics than gram positive bacteria (Parton and Stein, 2007) . CSLE strong activity against generally resistant gram negative bacteria makes it a promising candidate for quest of new antimicrobial agents of herbal origin. Previous phytochemical investigations have established the presence of sterols, tannin (ellagic acid), alkaloid, saponins etc which may be responsible for antimicrobial activity of the leaves of *Coriandrum sativum*. The promising activity against *E.coli , shigella spp, vibrio cholera* indicates the potent use of the leaves of plant in controlling diarrhoea and dysentery.

IN VITRO ANTIFUNGAL ACTIVITY:

The results in Table 4.8 depictated the MIC values of the methanolic extract of the leaf of *Coriandrum sativum (Linn)* against various tested fungal pathogens.

Table 8 : Determination of MIC of the methanolic extract of the leaves of *Coriandrum sativum* against different fungal strains:

S.No	Name of fungi	Dilution of methanolic whole plant extract (µg/mL) in Sabouraud's Dextrose Agar (SDA) media						
		0	100	200	400	1000	1500	2000
1	*Candida albicans* ATCC- 10231	±	-	-	-	-	-	-
2	*Candida albicans* 5	+	±	-	-	-	-	-
3	*Penicillium notatum*	+	±	±	-	-	-	-
4	*Aspergillus fumigatus* MTCC No. 3002	+	±	±	-	-	-	-
5	*Aspergillus niger* MTCC No. 281	+	±	±	-	-	-	-
6	*Phanerocheate chrysporium* MTCC No. 787	+	+	+	+	+	-	-

0 control, ± Inhibited growth, + growth, - Absence of growth

Methanolic extract of the leaves of *Coriandrum sativum* is highly active against various strains of Candida. It was found that *Candida albicans* 5 and *Candida albicans* MTCC 10231 were completely inhited at 200µg/mL . Inhibition of growth of *Penicillin notatum* started at 100µg/mL and was finally inhibited at 400µg/mL.

Both the strains of *Aspergillus fumigatus spp* were completely inhibited at 400 µg/mL of extract. *Phanerocheate chrysporium* MTCC No. 787 was fairly resistant to the tested extract as it is being completely inhibited at 1500µg/mL.

Table 9 : Determination of diameter of zone of inhibition (mm) produced by the methanolic extract of the leaves of *Coriandrum sativum* and its comparison with Griseofulvin against sensitive fungal strain:

		Diameter of zone of inhibition in mm against various doses							
S.No.	**Name of fungi**	**Griseofulvin (ug/ml)**				**Extract (ug/ml)**			
		400	**1000**	**1500**	**2000**	**400**	**1000**	**1500**	**2000**
1	*Candida albicans ATCC*- 10231	12	16	16	20	11	15	14	19
2	*Candida albicans* 5	10	12	15	18	8	10	15	17
3	*Penicillin notatum*	11	15	14	19	9	13	14	15
4	*Aspergillus fumigatus* MTCC No. 3002	10	12	16	19	9	11	16	21
5	*Aspergillus niger* MTCC No. 281	11	18	21	27	11	15	18	21
6	*Phanerocheate chrysporium*MTCC No. 787	10	15	16	18	8	12	15	19

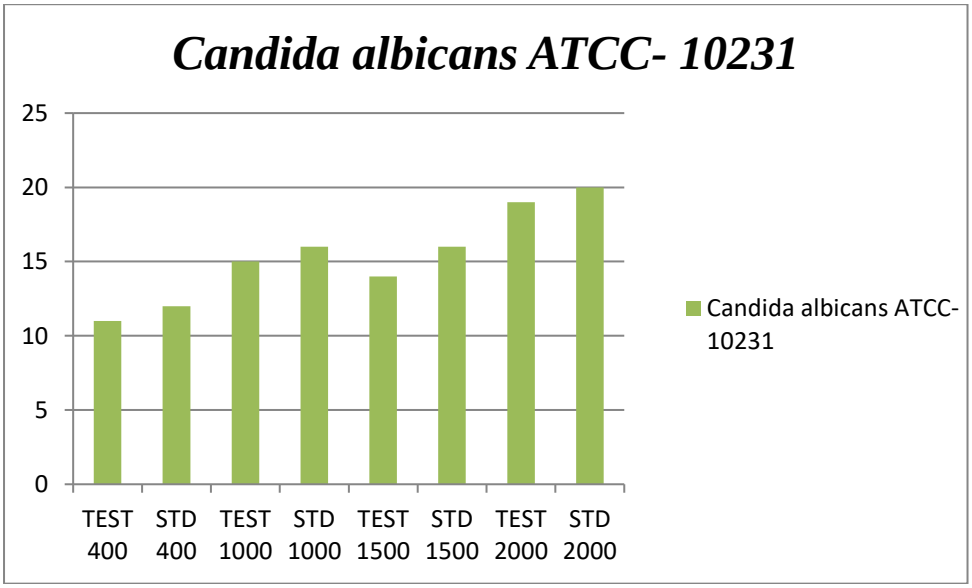

Fig 2: Graphical represention of anti fungal activity of CSLE and its comparison with Griseofulvin aginst *Candida albicans ATCC- 10231*

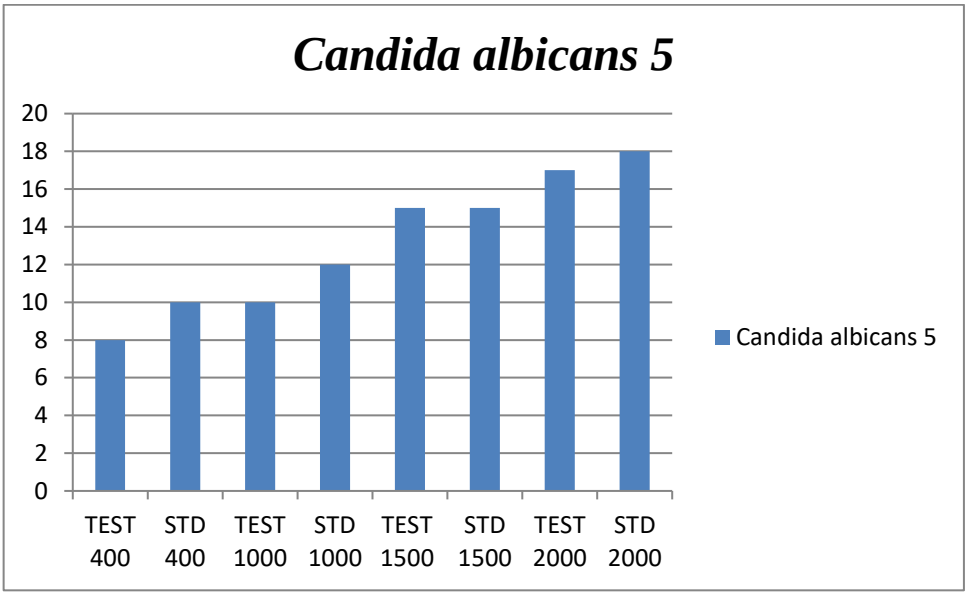

Fig 3: Graphical represention of anti fungal activity of CSLE and its comparison with Griseofulvin aginst *Candida albicans 5*

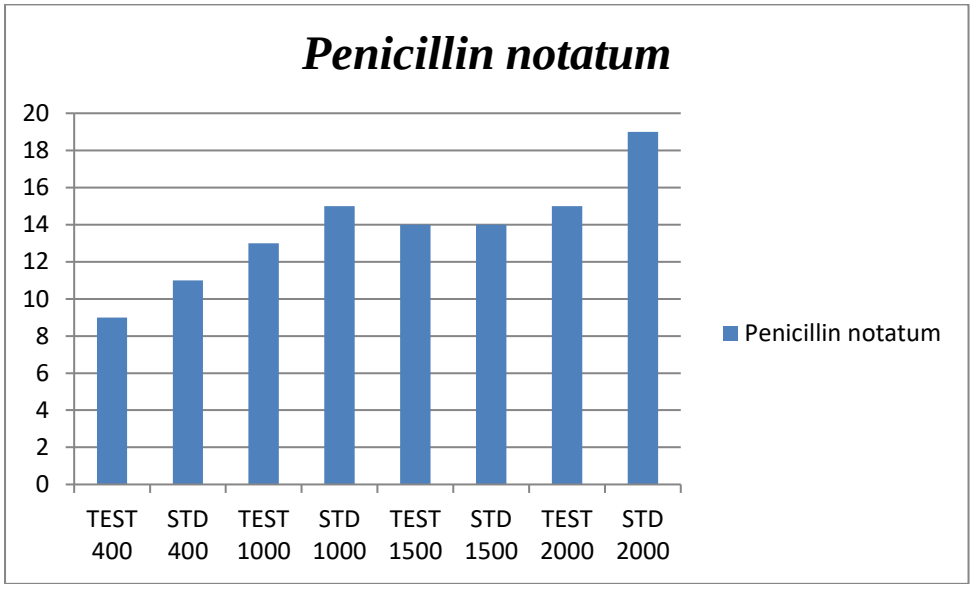

Fig 4: Graphical represention of anti fungal activity of CSLE and its comparison with Griseofulvin aginst *Penicillin notatum*.

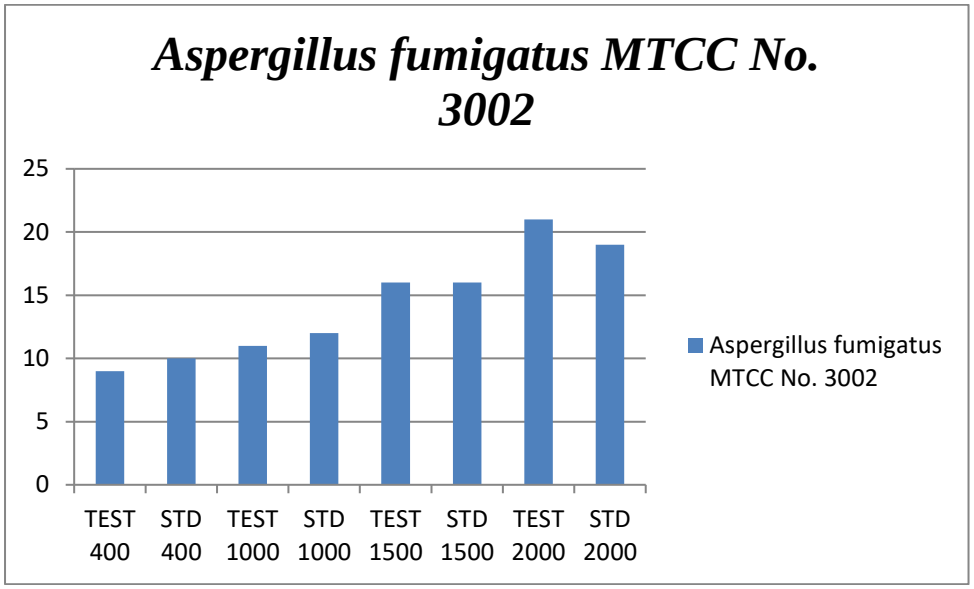

Fig 5: Graphical represention of anti fungal activity of CSLE and its comparison with Griseofulvin aginst *Aspergillus fumigatus MTCC No. 3002*

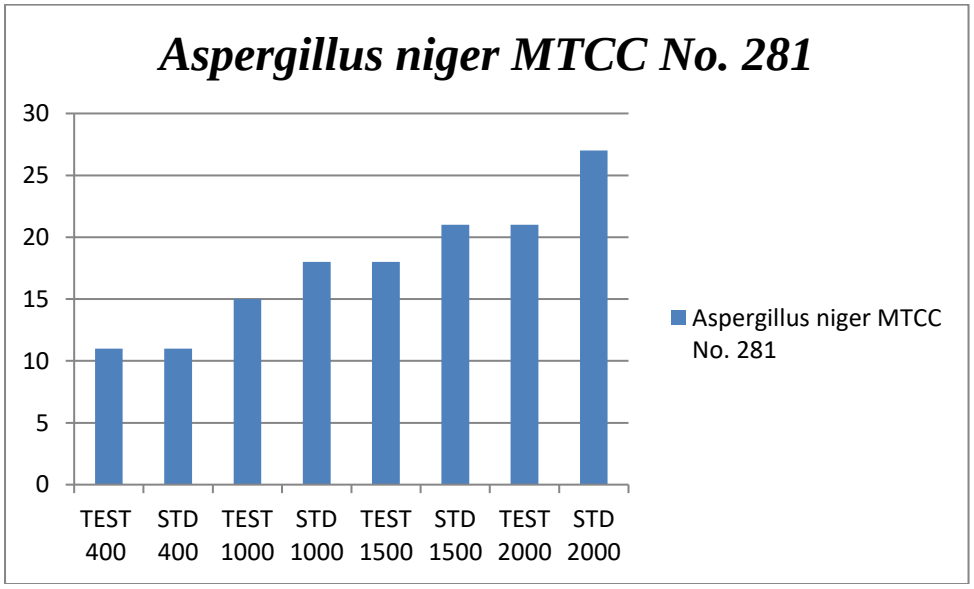

Fig 6: Graphical represention of anti fungal activity of CSLE and its comparison with Griseofulvin aginst *Aspergillus niger MTCC No. 281*

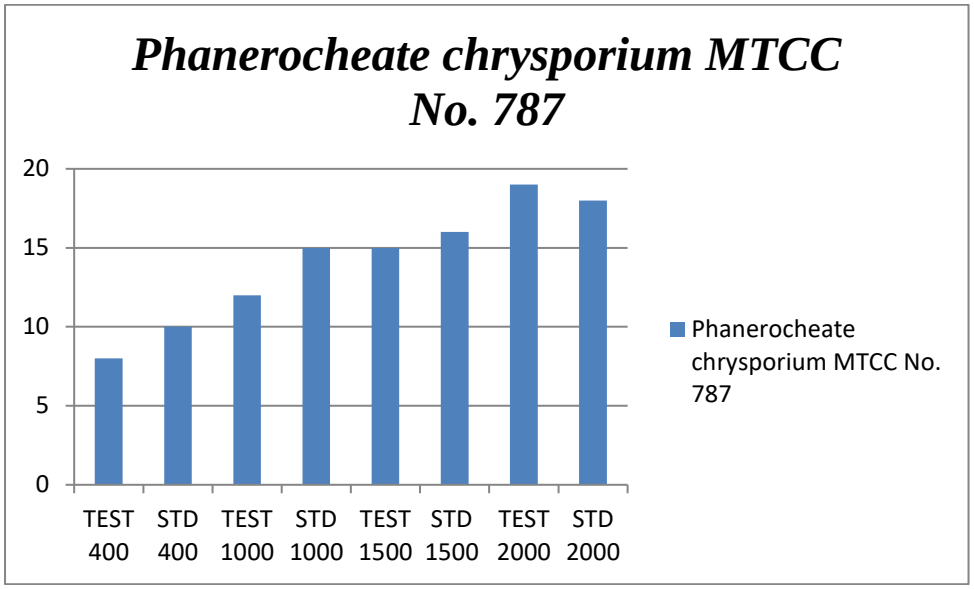

Fig 7: Graphical represention of anti fungal activity of CSLE and its comparison with Griseofulvin aginst *Phanerocheate chrysporium MTCC No. 787*

Antifungal activity of methanolic extract from the leaves of *Coriandrum Stivum* (400µg/mL, 1000µg/mL, 1500µg/mL, 2000µg/mL) were studied by using disc diffusion method in comparison to Griseofulvin as a standard against *Candida albicans* ATCC No. 10231, *Candida albicans* 5, *Penicillin notatum, Aspergillus fumigatus* MTCC No. 3002, *Aspergillus niger* MTCC No. 281, *Phaenarochaete chrysporium* MTCC No. 787. MIC for all fungi was found to be 400 µg/ml except *Candida albicans ATCC NO,10231* and which was inhibited at a concentration of 100µg/ml of extract and Candida albicans 5 which was inhibited at a concentration of 200 µg/ml. Maximum zone of inhibition was obtained with methanol extract against *Aspergillus niger* MTCC No. 281 and *Candida albicans* ATCC No. 10231 and less against other tested fungi. Results suggest that the methanolic extract from the leaves of *Coriandrum Sativum* exhibited significant antifungal activity against all tested fungi.

CONCLUSION

Coriander is an annual aromatic herb in the family of Umbelliferae (also called Apiaceae). The coriander plant is widely distributed in subtropic regions and is mainly cultivated for its seeds. It has a unique aroma and flavour and is an important culinary herb widely used in Mexican, Asian and Caribbean cuisine. The plant posses various pharmacological activities including its use as antidiabetic, antioxidant, antihelmentic, antidiuretic, anxiolytic.The current works aims to justify the folklore use of the leaves of the *Coriandrum sativum* for its antidiabetic, antipyretic and antimicrobial potentiality. In addition Preliminary phytochemical tests of the methanolic extract from the leaves of *Coriandrum sativum* revealed the presences of alkaloid, carbohydrates, flavonoids, glycosides, lignin, saponin, terpenes, tannins.

In the acute toxicity study the methaolic extract of the leaves of *Coriandrum sativum* was found to be safe up to 2000 mg/kg body wt by oral route. After 24 hrs , animals were found well tolerated. Therewas no mortality and no sign of toxicity and extract was found to be safe. Methanolic extract of the leaves of *Coriandrum sativum* was used for the screening of antidiabetic , antipyretic and antimicrobial potentiality.

DIABETES

In light of the results, our study indicates that methanolic extracts of the leaves of *Coriandrum sativum* have good antidiabetic activity. Alcoholic extracts of *Coriandrum sativum* exhibited significant antihyperglycemic activities in alloxan-induced hyperglycemic rats with significant change in body weight. They can also improve the condition of Diabetic mellitus as indicated by parameters like body

weight & lipid profile along with serum creatinine, serum urea and serum alkaline phosphatase. The renewal of β cells in diabetes have been studied in several animal models. The total β cell mass reflects the balance between the renewal and loss of these cells. Alcoholic extracts of *Coriandrum sativum* has been shown to act by β cell regeneration. Administration of alloxan destroys β – cells of the islets of Langerhans in pancreas. Destruction of β- cells in pancreas causes marked decrease in serum insulin levels. The moderate action of standard drug Glibenclamide in alloxan – induced diabetic rats can be attributed to the presence of only negligible number of β- cells present in the pancreas to produce any secretogogue action by Glibenclamide. Alcoholic extracts of *Coriandrum sativum* exhibited only moderate dose dependent antihyperglycemic activity in alloxan induced diabetic rats.The possible mechanism may be either the extracts increase the glucose utilization in the periphery or decrease the endogenous glucose production in the liver. The mechanism via intestinal delay or inhibition of glucose can be ruled out as the animals used in the study were fasted overnight prior to the start of the experiment.

Extract of the leaves of the plant at dose 200 and 400 mg /kg. In the present study blood glucose level of diabetic control rats were found to be markedly decreased by the extract when compared with the normal control rats when tested in alloxan induced diabetic model. Diabetic conditions are associated with the elevated lipid levels along with the hyperglycemia. Levels of plasma triglycerides and cholesterol in individuals in various types of diabetes are higher than that of normal subkects. Lipid profile , which is altered in the serum of diabetic patients , appears to be a significant factor in the development of premature atherosclerosis and includes an increase in triglyceride and total cholesterol. In experimental diabetes, administering alloxan produces insulin deficiency. It produces hyperglycemia as well as dyslipidemia as indicated by the rise of triglycerides, LDL and VLDL. The liver and some other tissues participate in the uptake , oxidation and metabolic conversion of free fatty acids, synthesis of cholesterol and phospholipids and secretion of specific classes of plasma lipoproteins. Lowering of serum lipid levels through dietary or drug therapy seems to be associated with a decrese in the risk of vascular disease and related complications. Many herbs and plant products have been shown to have antihyperglycemic property.

Results indicate that the blood glucose level of diabetes control rats were found to be markedly decresed by the extract when compared with the normal control rats when tested in alloxan induced diabetic model. Induction of diabetes in rats with alloxan elevated the circulating lipid levels. Serum cholesterol levels and various fractions of lipoproteins such as LDL, HDL, VLDL and triglycerides were found to be increased when compared with normal untreated control rats. Treatment with insulin brought down the levels of increased lipoproteins and total cholesterol. Administration of extract of *Coriandrum sativum* decreased the levels of circulating lipids. From the results, it is evident that methanolic extracts of *Coriandrum sativum* possessed antidiabetic activity.

Diabetic conditions are associated with the elevated lipid levels along with the hyperglycemia. Levels of plasma triglycerides and cholesterol in individuals in various types of diabetes are higher than that of normal subjects. Lipid profile , which is altered in the serum of diabetic patients, appears to be a significant factor in the development of premature atherosclerosis and includes an increase in triglyceride and total cholesterol levels. Thus we can conclude that methanolic extract of *Coriandrum sativum* is having good antidiabetic activity.

ANTIPYRETIC

The present study showed that the methanolic extract of the leaves of *Coriandrum sativum*(CSLE) possessed significant antipyretic activity in Brewer's yeast-induced pyrexia. The standard (paracetamol) achieved maximum antipyretic activity in 3 h; its activity decreased subsequently probably due to metabolism and excretion of the drug. On the other hand, maximum antipyretic activity for CSLE occurred at 6 h, indicating slow but steady absorption of the drug from the GIT. This may have been responsible for the prolonged action of the extract. Subsequently, up to the 8th hour, its activity remained largely unchanged. The antipyretic activity of the extract was dose-dependent with the higher dose producing greater activity. The hypothalamus regulates body

temperature with a delicate balance between heat production and heat loss through the set-point control. Infection, tissue damage, inflammation, graft rejection, malignancy and several other ill-health conditions may elevate the set point to induce fever . When the set point is raised, enhancement of the body temperature takes place through active generation and retention of heat. Vasoconstriction also helps to reduce heat loss through skin. In this way, the body matches the brain blood temperature with the new set point made by the hypothalamus . Biochemically, during fever, enhanced formation of cytokines such as interleukins (IL-1_, IL-1_, IL-6 andIL-6,interferon.tumour necrosis factor alpha (TNF_) takes place under such physiological conditions. These cytokine factors migrate to circum ventricular organs of the brain and bind with endothelial receptors on vessel walls or interact with local microglial cells. After binding, it activates the arachidonic acid pathway which enhances the synthesis of prostaglandin E2 (PGE2). The pathway consists of the enzymes phospholipase A2, cyclo-oxygenase-2 (COX-2) and prostaglandin E2 synthase, which are responsible for the synthesis and release of PGE2. PGE2 is the final mediator for febrile response. The set point temperature of the body remains elevated until PGE2 is present in the hypothalamus . Again, PGE2 triggers the hypothalamus for more formation of heat by minimizing heat loss through cyclic adenosine mono-phosphate (cAMP) pathways . It has been established that yeast induces pathogenic fever in rat by enhancing the production of prostaglandins, mainly PGE2, which elevates the set point of the thermoregulatory centre in hypothalamus. Paracetamol possesses potent antipyretic and analgesic activities with minimal anti-inflammatory activity. It may selectively inhibit specific COX isoform in the CNS to inhibit prostaglandin synthesis to achieve its antipyretic effect but does not influence body temperature when it is elevated by factors such as exercise or increase in ambient temperature. Certain phytochemical compounds such as steroids, β- sitosterol, carbohydrates, tannins, triterpenoids, flavonoid and coumarin glycosides were found to be present in the extract during phytochemical screening. The antipyretic potentials of steroids, tannins, triterpenoids, flavonoid and coumarin glycosides have been reported in various studies . Therefore, the antipyretic activity of CSLE mainly due to its contents of β- sitosterol . Furthermore, indirect evidence seems to support the influence of CSLE on the biosynthesis of prostaglandin (PGE2) which is a regulator of body temperature, this may also partly account for its antipyretic activity in yeast-induced pyrexia model.

The results of antipyretic study showed that CSLE posess a significant antipyretic effect in reducing yeast induced elevated body temperature in rats and their effects were comparable to standard drug Paracetamol. It was found that CSLE at dose of 200 and 400 mg/kg body weight caused significant ($p< 0.01$) lowering of body temperature up to 5 h after administration. The antipyretic activity of CSLE was partly due to inhibition of prostaglandin biosynthesis and partly due to action against *S.aureus*. The presence of phytoconstituents β- sitosterol was responsible for this activity.

ANTIMICROBIAL

The result of antibacterial study showed that CSLE posses a potent inhibitory activity against bacteria and fungi. Amongst the Gram negative bacteria (*E.coli, Shigella spp, Vibrio spp*) were significantly inhibited while moderate inhibitory action was noted aginst gram positive bacteria (*Bacillus spp, S. aureus*) organisms. The disc diffusion method employed for assay of antibacterial activity revealed that CSLE has antibacterial potentiality comparable to standard drug Ciprofloxacin especially against Gram negative bacteria. Its promising antimicrobial potentiality especially against Gram negative strains like *E.coli, Shigella* species provides the rational for its traditional use in treatment of infections.

In the antifungal screening , highest inhibition was noted for *Candida spp*. Moderate inhibition of extract was observed for the tested strains of *Aspergillus spp* and *Penicillum notatum*. However *Phanerocheat chrysporium* was inhibited at a concentration of 1500µg/ml of the leaf extract indicating its comparatively less sensitivity. However the Result suggest that the methanolic extract from the leaves of *Coriandrum sativum* exhibited significant antifungal activity against all tested fungi.

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