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Emerging Trends in Physical Sciences and Chemical Sciences

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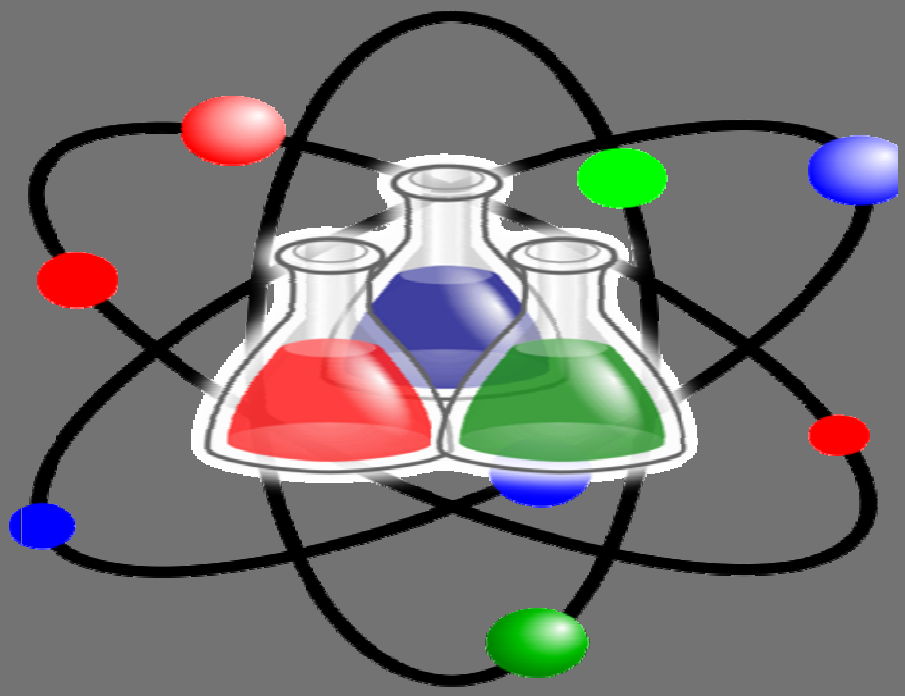

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2. **Induction of Inflammation**: λ-Carrageenan was prepared at least 12 hour before the injection in rat paw. To induce inflammation in rat, as an inflammatory stimulus, Carrageenan (Sigma Aldrich Ltd.) was injected in the right rear paw of the animals at a dose of 0.1 ml of 1% solution in saline at least 20 min. before administration of standard drug[50,51,52].

3. **Measurement of Paw Volume**: An Ugo Basile Plethysmometer (Model 7140, Italy) was used to measure the paw volumes. The recording of paw volumes (in ml) was performed at an interval of 1–3 h. The volume of paw recorded just before Carrageenan injection was recorded as initial volume **(V_0)** in each case. At the end of three hour percentage inhibition was calculated [50,51,52].

Results:

The results of phytochemical analysis of *Tribulus terrestris* are given in table 1, 2 and 3. The performed phytochemical analysis revealed the presence of alkaloids, flavonoids, saponins, steroids, glycosides and phenolic compounds in the plant. The results also indicate that the methanol extracts of leaves and fruits of *Tribulus terrestris* are rich in saponins, glycosides, flavonoids and phenolic compounds.

Table 1: Phytochemical analysis of Ethanol extract of *Tribulus terrestris*

Test	Leaves	Stem	Fruit
Alkaloid	+	-	+
Steroid	-	-	-
Terpenoid	-	-	+
Flavonoid	+		+
Phenols	+	+	+
tannins	+	+	+
Cardiac gkycosides	+	+	+
saponins	-	-	+

+ = Presence, - = absence

Table 4: Antimicrobial activities (diameter in mm) of ethanol exctract of fruit, stem, and leaves.

Extract	Bacteria		Fungi	
	E. coli	S. aureus	C. albicans	A. niger
Fruit	11.2	11.49	-	13.98
Stem	11.14	12.87	-	12.19
Leaves	12.13	11.37	9.98	18.94
C	30.32	29.82	-	-
A	-	-	18.55	18.13

E. coli = Escherichia coli, S. aureus = Staphylococus aureus, C. albicans = Candida albicans, A. niger = Aspergillus niger, C = Chloramphenicol (Standard

antibacterial), A = Amphotericin B (Standard antifungal)

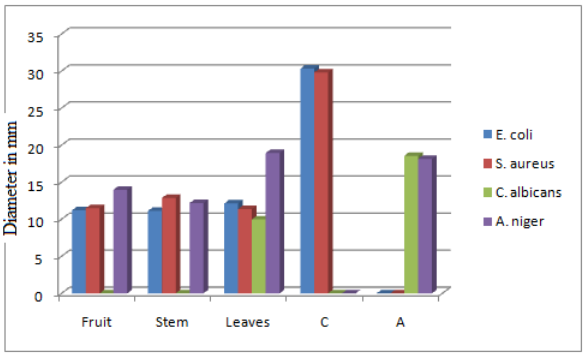

Fig. no. 1 An antimicrobial activity (diameter in mm) of Ethanol extract of fruit, stem, and leaves of *Tribulus terrestris* L.

Table 3: %Antioxidant activity of ethanol extracts by DPPH method

Extract	Concentration		
	200 µg/ml	400 µg/ml	600 µg/ml
Fruit	11.8%	20.31%	32.18%
Stem	36.76%	38.56%	41.2%
Leves	50.63%	49.39%	51.44%
Ascorbic acid	81.27%	83.49%	96.67%
Control	00	00	00

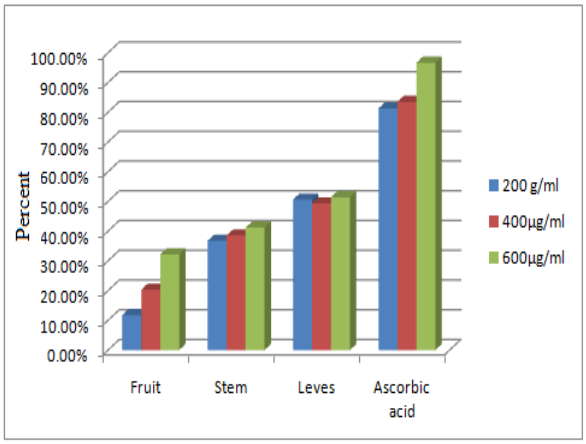

Fig. no. 1 An Antioxidant activity of Ethanol extracts of fruit, stem, and leaves of *Tribulus terrestris* L.

Table no. 4 Anti-inflammatory activity of Ethanol extracts of Fruit, stem and leaves of *Tribulus terrestris* L.

Group	Dose (mg/kg)	Change in Mean Paw Volume			P Value
		1hr	2hr	3hr	
Control	1ml/Kg	1.2 ± 0.047	1.2 ± 0.066	1.58 ± 0.083	---------
Diclofenac sodium	10 mg/Kg	0.53 ± 0.037***	0.53 ± 0.088	0.402 ± 0.027***	P< 0.0001
TTLEE	100mg/kg	1.5 ± 0.064***	1.3 ± 0.049***	0.695 ± 0.078	P< 0.001
TTSEE	--	--	--	--	--
TTFEE	--	--	--	--	--

TTLEE= *Tribulus terrestris* Leaves ethanol extract, TTSEE= *Tribulus terrestris* Stem ethanol extract, TTSEE= *Tribulus terrestris* fruit ethanol extract.

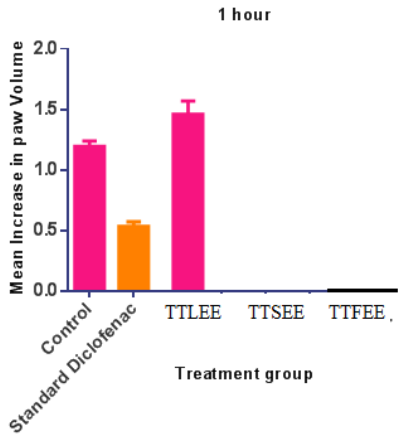

Figure no. 3 Effect of compounds on mean increase in paw volume after 1 hour on drug. The data were expressed as mean ± SEM. The significance was determined by one-way ANOVA followed by *Bonferroni's post hoc test.*

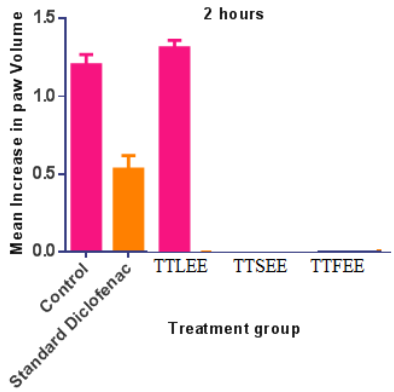

Figure no. 4 Effect of compounds on mean increase in paw volume after 2 hour on drug. The data were expressed as mean ± SEM.

The significance was determined by one-way ANOVA followed by *Bonferroni's post hoc test*. p<0.001 when 19 compared to positive control.

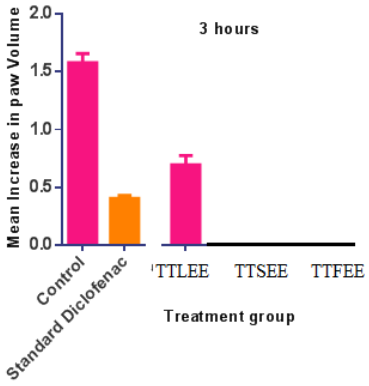

Figure no. 5 Effect of compounds on mean increase in paw volume after 3 hour on drug. The data were expressed as mean ± SEM. The significance was determined by one-way ANOVA followed by *Bonferroni's post hoc test*. p<0.001 when 15 compared to positive control. . p<0.001 when 16 compared to positive control.

Discussion:

Phytochemical screening of different parts of *Tribulus terrestris* is carried out using ethanol as a solvent. Leaves extract shows presence of alkaloids, phenols, tannins, and cardiac glycosides. Stem extract shows presence of phenols, tannins, cardiac glycosides. Fruit extract shows presence of alkaloids, terpenoides, Flavanoids, phenols, tannins, cardiac glycosides, and saponins.

An antimicrobial activity (diameter in mm) of ethanol extract of leaves, stem, and fruit showed against bacteria *Escherichia coli*, *Staphylococcus aureus* and fungi *Candida albicans* and *Aspergillus niger*. Leaves extract showed potent activity against bacteria *Escherichia coli* with forming diameter of 12.13mm, *Staphylococcus aureus* with forming diameter of 11.37mm and fungi *Candida albicans* with forming diameter of 9.98mm and *Aspergillus niger* with forming diameter of 18.94mm. Stem extract shows potent against bacteria *Escherichia coli* with forming diameter of 11.14mm, *Staphylococcus aureus* with forming diameter of 12.87 mm and fungi *Aspergillus, niger* with forming diameter of 12.19mm. Fruit extract shows activity against bacteria *Escherichia coli* with forming diameter of 11.02 mm and *Staphylococcus aureus* with forming diameter of 11.49mm *Aspergillus niger* with forming diameter of 13.98mm

The ethanol extract of leaves *Tribulus terrestris* showed the mild scavenging activity 50.36%, 49.39%, 51.44% at three concentrations 200 µg/ml, 400 µg/ml and 600 µg/ml respectively. Stem extract showed 36.76%, 38.56%, and 61.2% respectively. Fruit exctract showed 11.8%, 20.31%, and 32.18% respectively.

The ethanol extract of leaves *Tribulus terrestris* L showed anti-inflammatory activity, but stem and leaves does not show the anti-inflammatory activity.

Conclusion:

Phytochemical screening of different parts of *Tribulus terrestris* L. is carried out using ethanol as a solvent, shows presence of important secondary metabolites. These metabolites can be used to cure some infectious diseases. The use of herbal crude drugs, in tracts and their remedies have significantly increased throughout the world. Ethanol extract of fruit, stem, and leaves of *Tribulus terrestris* L. showed potent activity against bacteria and fungi *Escherichia coli*, *Staphylococcus aureus* and fungi *Candida albicans* and *Aspergillus niger*, it also shows scavenging activity at three concentrations 200 µg/ml, 400 µg/ml and 600 µg/ml. The ethanol extract of leaves *Tribulus terrestris* showed anti-inflammatory activity.The scientific and authentic researches on these aspects are to be done in order to exploit traditional knowledge of medicinal plants.

Declarations:

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Author's contribution:

S. P. Mahire carried out the collection of plant from Dhule and Nandurbar districts, extraction process using ethanol, Preliminary Screening of secondary metabolites and wrote the manuscript. Dr. S. N. Patel supervised research work and improved the quality of final manuscript. Both authors read and approved the final manuscript.

Competing interest:

The authors declare that they have no competing interest.

Ethics and approval: Approval for this study was obtained from the Institutional Animal Ethical Committee constituted under the 'Committee for the Purpose of Control and Supervision on Experiments on Animals' (CPCSEA) regulations, Government of India.

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