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# Bioactivities of Desmostachya bipinnata (L.) Stapf

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#### Abstract

Desmostachya bipinnata (L.) Stapf is a grass that goes to the Poaceae family. It is used to treat such as wounds, urinary tract disorders, rheumatism, piles, and cholera. Until now, there is no comprehensive systemic review of bioactivities of D. bipinnata. Thus, this article evaluates, reviews, and documents the reported bioactivities of this plant species. Reported studies show that various parts of D. bipinnata have anticancer, antibacterial, antiurolithiasis, antidiarrheal, hepatoprotective, and antioxidant activities. So far, only in vitro and in vivo levels of scientific evidence are existing for bioactivities. β-Sitosterol-D-glucopyranoside was the only bioactive compound that has been isolated from this plant species. This compound exhibited antibacterial activities. The findings of this work valuably contribute to future bioactivities and phytochemistry researches related to this plant species.

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## Introduction

Desmostachya bipinnata (L.) Stapf [synonyms: Briza bipinnata L.; Cynosurus durus Forssk.; Dactylis interrupta Rottler ex Stapf; D. cynosuroides (Retz.) Stapf ex Massey; D. pingalaiae Raole & R.J.Desai; Dinebra dura Lag.; Eragrostis bipinnata (L.) K.Schum.; E. cynosuroides (Retz.) P.Beauv.; E. thunbergii Baill.; Leptochloa bipinnata (L.) Hochst.; bipinnata (L.) P.Beauv.; Megastachya cynosuroides Retz.; Pogonarthria bipinnata (L.) Chiov.; Rabdochloa bipinnata (L.) Kuntze; Stapfiola bipinnata (L.) Kuntze; and Uniola bipinnata (L.) L.] is a grass that goes to the Poaceae family [1]. It is native to Asia (Afghanistan, Bangladesh, Cambodia, China, India, Iran, Iraq, Laos, Lebanon, Syria, Myanmar, Nepal, Oman, Pakistan, Palestine, Saudi Arabia, Thailand, Vietnam, and Yemen) and Africa (Algeria, Central African Republic, Chad, Egypt, Eritrea, Ethiopia, Kenya, Libya, Mauritania, Morocco, Niger, Somalia, Sudan, Tanzania, Tunisia, and Uganda) and introduced into Indonesia [1,2]. Furthermore, D. bipinnata is called Tharuppai in

#### **Materials and Method**

Major electronic databases like the Web of Science, Scopus, PubMed, and ScienceDirect were employed to identify the suitable publications from 1900 to May 2021. "Desmostachya bipinnata" was utilized as an exploration term and only articles related to bioactivities were taken into account in this work.

# Results and discussion Reported bioactivities

More data together with the level of scientific evidence, bioactivity, part used, extract, bioassay/model, dose/concentration, duration, and reference are presented in Table 1. So far, only *in* 

Tamil. This plant species broadly utilized in Saiva rituals in India and Sri Lanka. Various parts of D. bipinnata are utilized to cure many illnesses in traditional medicines. Leaves are applied to heal wounds and urinary tract disorders (1) and roots are used to treat rheumatism, piles, cholera, wounds, carbuncles, dysuria, leucorrhea, dysentery [2-4]. Also, culms are utilized to cure skin diseases, diarrhea, urinary tract disorders, asthma, liver disorders, and menorrhagia [5-7]. Compounds including 2,6-dihydroxy-7-methoxy-3H-xanthen-3-one, β-sitosterol-d-glucopyranoside, quercetin, apigenin, and luteolin have been isolated from this plant species [8,9].

The aim of this minireview to systematically analyze, summarize, and document the reported bioactivities of this *D. bipinnata*. As mentioned above, this plant species has numerous applications in traditional medicines. Hence, this work will be useful to conduct future pharmacological and phytochemical studies of *D. bipinnata* regarding its traditional medicinal uses.

vitro and in vivo levels of scientific evidence are existing for the bioactivities of these different parts of plant species. More in vitro evidence available and the majority of the studies were carried out to study the antibacterial activities. The methanol extract was used in a greater number of investigations and roots exhibited more bioactivities of this plant species. Anyhow, only one bioactive compound has been isolated from D. bipinnata.  $\beta$ -Sitosterol-D-glucopyranoside isolated from leaves exhibited antibacterial activities [9]. Traditional medicinal uses such as urinary tract disorders, cholera, and liver disorders only have been evidenced by some researches. Only more important reported studies

(based on the lower concentration / dose) are deliberated below.

# Reported *in vitro* studies Antibacterial activity

Aerial, leaf, and whole plant of this plant species showed antibacterial activities.  $\beta$ -Sitosterol-D-glucopyranoside at (MIC 6.2  $\mu$ g/ml) isolated from leaves exhibited antibacterial activity in *Vibrio cholera* assay [9].

## **Anticancer activity**

A study conducted by Rahate et al. (2012) used root methanol (70%) (IC<sub>50</sub> 109  $\mu$ g/mL) in human cervical cancer cell lines [10].

Table 1: Reported bioactivities of D. bipinnata

## **Antidiarrheal activity**

Methanol (70%) was prepared using the whole plant (100 mg/kg) was orally administered to castor oil–induced diarrhea in mice. After 6 hours antidiarrheal activity was observed and the health conditions were improved [11].

## **Antioxidant activity**

Root and whole plant of this plant unveiled antioxidant activities. Root hydroalcoholic extract at 23  $\mu$ g/mL (IC<sub>50</sub>) showed antioxidant activity in the ferric reducing ability of plasma assay [12].

Level of	Bioactivity	Part	Extract/Co	Assay/Model	Dose/Co	Ref.
scientific		used	mpound		ncentration	
evidence						
In vitro	Antibacterial	Aerial	Ethanol (95%), ether, n-butanol	Helicobacter pylori	30 μL	[13]
In vitro	Antibacterial	Leaf	Methanol (70%)	Bacillus subtilis, Shigella dysenteriae	200 μg/mL	[9]
			Methanol (70%)	Enterococcus faecalis, Staphylococcus aureus	400 μg/mL	
			Methanol (70%)	Escherichia coli	460 μg/mL	
			Methanol (70%)	Klebsiella pneumonia	320 μg/mL	
			Methanol	Vibrio cholera	250 μg/mL	

Level scientific evidence	of	Bioactivity	Part used	Extract/Co mpound	Assay/Model	Dose/Co ncentration	Ref.
				β- Sitosterol-D- glucopyranosi de	Bacillus subtilis, Escherichia coli	12.5 μg/mL (MIC)	
				β- Sitosterol-D- glucopyranosi de	Enterococcus faecalis	15 μg/mL (MIC)	
				β- Sitosterol-D- glucopyranosi de	Klebsiella pneumonia, Proteus mirabilis	25 μg/mL (MIC)	
				β- Sitosterol-D- glucopyranosi de	Proteus vulgaris	17 μg/mL (MIC)	
				β- Sitosterol-D- glucopyranosi de	Pseudomonas aeruginosa	10 μg/mL (MIC)	
				β- Sitosterol-D- glucopyranosi de	Shigella dysenteriae	12 μg/mL (MIC)	
				β- Sitosterol-D- glucopyranosi de	Staphylococcus aureus	24 μg/mL (MIC)	

Level	of	Bioactivity	Part	Extract/Co	Assay/Model	Dose/Co	Ref.
scientific			used	mpound		ncentration	
evidence							
				β-	Vibrio cholera	6.2	
				Sitosterol-D-		μg/mL	
				glucopyranosi		(MIC)	
				de			
In vitro		Antibacterial	Whol	Acetone,	TLC bio-autography for	NS	[14]
			e plant	chloroform,	antibacterial activity		
				ethanol,	(Pseudomonas aeruginosa)		
				petroleum			
In vitro		Anticancer	Root	Methanol	Human cervical cancer	109	[10]
111 11110		Timeleancer	Root	(70%)	cell	μg/mL (IC <sub>50</sub> )	[10]
				(,,,,,		(30)	
				Methanol	Human laryngeal	166	
				(70%)	epithelial carcinoma cell	μg/mL (IC <sub>50</sub> )	
				Methanol	NIH/3T3 cell	216	
				(70%)		μg/mL (IC <sub>50</sub> )	
In vitro		Antioxidant	Root	Hydroalco	DPPH radical scavenging	78 μg/mL	[12]
				hol		(IC <sub>50</sub> )	
				Hydroalco	Ferric reducing ability of	23 μg/mL	
				hol	plasma	(IC <sub>50</sub> )	
In vitro		Antioxidant	Root	Methanol	DDPH free radical	471	[10]
				(70%)	scavenging	μg/mL (IC <sub>50</sub> )	
				Methanol	Hydrogen peroxide	127	
				(70%)	scavenging	μg/mL (IC <sub>50</sub> )	

Level	of	Bioactivity	Part	Extract/Co	Assay/Model	Dose/Co	Ref.
scientific			used	mpound		ncentration	
evidence							
				Methanol	Hydroxyl radical	434	
				(70%)	scavenging	μg/mL(IC <sub>50</sub> )	
				Methanol	Nitric oxide radical	163	
				(70%)	scavenging	μg/mL (IC <sub>50</sub> )	
In vitro		Antioxidant	Whol	Acetone,	TLC bioautography for	NS	[14]
200 70070			e plant	chloroform,	antioxidant activity		[]
				ethanol,			
				petroleum			
In vitro		Hepatoprote	Root	Methanol	BRL3A cell	NS	[8]
		ctive		(70%)			
In vivo		Antidiarrhea	Whol	Methanol	Castor oil-induced	100	[11]
		1	e plant	(70%)	diarrhea in mouse	mg/kg	
In vivo		Anti-	Aerial	Aqueous	Rat	400	[15]
		urolithiasis				mg/kg	
In vivo		Hepatoprote	Root	Methanol	Tamoxifen-induced	100	[8]
		ctive		(70%)	hepatotoxic rat	mg/kg	
In vivo		Sedative	Root	Aqueous	Mouse	10 mL/kg	[16]
1			1				

AbbreviationsDPPH: (1,1-diphenyl-2-picrylhydrazyl);  $IC_{50}$ : Half maximal inhibitory concentration; MIC: The minimum inhibitory concentration; NA: Not applicable; NS: Not stated; TLC: Thin Layer Chromatography

#### In vivo studies

## **Anti-urolithiasis activity**

Kishore et al. (2014) orally administered 400 mg/kg of aerial aqueous extract to rats for 10 days improved urolithiasis conditions [15].

## Hepatoprotective activity

Root methanol (70%) extract (100 mg/kg) was orally directed to tamoxifen-induced hepatotoxic rats for 21 days showed protective effects in the liver [8].

## **Sedative activity**

An extract prepared root and water (10 mL/kg) was injected into mice observed sedative effects after 30 minutes [16].

## **Conclusion**

Reported bioactivities approve the ethnomedicinal uses of D. bipinnata. On the other hand, more ethnomedicinal uses have no scientific evidence at the moment. Therefore, more in vitro, in vivo, and clinical investigations should be carried out in the future. Also, the active compounds should be discovered and they might be a lead compound in a future drug. The findings of this work valuably contribute future bioactivities to and phytochemistry researches related to this plant species.

### **Conflict of interest**

None of the authors have any conflict of interest to declare.

## **Consent for publications**

All authors approved the final manuscript for publication.

## Availability of data and material

Data are available on request from the authors.

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