

Review Article

RECENT RESEARCHES ON D-PINITOL

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ARTICLE INFO

Received 03 January 2022

Revised 13 January 2022

Accepted 28 January 2022

Keywords:

- d-pinitol
- Azole derivatives,
- Bougainvillea spectabilis,
- Methyl Inositol,
- Clinical Trial

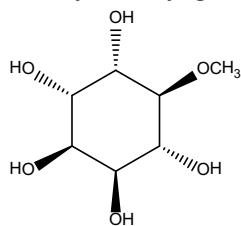
ABSTRACT

D-pinitol or 3-O-Methyl-D-chiro-inositol is a member of the flavonoid family. It is a hexahydroxy cyclohexane whose 3rd position is substituted by a methyl group. It exhibits a wide range of pharmacological activities such as antidiabetic, anticancer, anti-osteoporosis, anti-inflammatory, antioxidant, hepatoprotective and immunomodulatory activity. Azole Nucleosides Derivatives of D-Pinitol is used as an anti-tumour agent. D-Pinitol or Methyl Inositol is also in clinical trial for Alzheimer's Disease (AD) / Dementia.

1. INTRODUCTION

Due to lesser side effects and ease of availability, herbal drugs are gaining popularity all over the world¹. *Bougainvillea spectabilis* (Family: Nyctaginaceae) is an herbal drug candidate which exhibited a wide range of pharmacological activities such as antimicrobial, antioxidant, antidiabetic, anticancer, anti-inflammatory, antihepatotoxic, antiulcer and antihyperlipidemic [1-9]. A major soluble carbohydrate, d-pinitol which is found in the leaves of *Bougainvillea* also exhibited a wide range of pharmacological activities such as antidiabetic, anticancer, anti-osteoporosis, anti-inflammatory, antioxidant, hepatoprotective and immunomodulatory activity [10-16].

D-pinitol or 3-O-Methyl-D-chiro-inositol is a member of the flavonoid family [17]. It is a hexahydroxy cyclohexane whose 3rd position is substituted by a methyl group.



d-pinitol

Figure 1: Structure of d-pinitol

In traditional medicine, four species and one hybrid of *Bougainvillea* have been reported. The pharmacological investigations done on various crude extracts and isolated chemical compounds is described below:

1.1 Analgesic

Species such as *B. glabra* and *B. x buttiana* have showed analgesic activity [18]. For methanolic extracts of *B. glabra*, the maximum percentage of analgesia effect obtained using the tail method in male Wistar rats was 79.88%. For the ethanol extracts of *B. x buttiana* (var. Orange), the analgesic effect was studied in female CD1 mice using the acetic acid and formalin methods. For the acetic acid method, the analgesia percentage was 95.65%, while, for formalin method, the extract showed inhibition in both phases. In another study, the analgesic effect of the *B. x buttiana* (var. Rose) ethanol extract was determined after oral administration in BALB/c mice using the acetic acid, tail immersion, and formalin models. For all of the methods used, the extract showed a potent analgesic effect.

1.2 Anti-Inflammatory

When male wistar rats were orally treated with methanol extract of leaves from *B. glabra*, a significant anti-inflammatory activity was obtained [19].

Different solvents are used for extraction of the active constituent from the leaves of *B. spectabilis* like chloroform, acetone, alcohol, petroleum ether, and chloroform: water. In all inflammation models, elevated activity is shown with methanol extract.

1.3 Antipyretic

Antipyretic activity was obtained when methanol extracts of *B. glabra* were orally administered in groups of rats [20].

1.4 Antidiabetic

Three species of *Bougainvillea*, *B. glabra*, *B. spectabilis* and *B. x buttiana* showed antidiabetic effects in previous studies [21]. In Wistar rats, diabetes was induced using alloxan. Extracts of leaves or flowers of *B. glabra* were used in male Wistar rats for its antidiabetic action. In diabetic Swiss mice, reduced glucose levels are shown by the chloroform extract of flowers from *B. spectabilis* which is administered intraperitoneally. In female and male CD1 mice, hypoglycaemic activity was observed when ethanol extracts of bracts and flowers from *B. x buttiana* was administered orally.

1.5 Antihyperlipidemic

Reduction in the amount of total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-Cholesterol), and increase high-density lipoprotein cholesterol (HDL-C) was observed when male wistar rats were treated with different extracts from *B. glabra* [22].

Another study was performed using Wistar rats and ethanol extract of fresh leaves from *B. spectabilis* was administered orally which showed a significant reduction in total cholesterol (TC), triglyceride (TG), low-density lipoprotein (LDL), and very low-density lipoprotein (VLDL) levels and significant ($p < 0.01$) increase in high-density lipoproteins (HDL) in hypercholesterolemia rats.

1.6 Antidiarrhoeal

Oral administration of acetone extract of leaves of *B. glabra* “Choicy” in male Wistar rats showed significant antidiarrhoeal activity [23].

1.7 Antiulcer

When acetone extracts of leaves of *B. glabra* “Choicy” were orally administered in male Wistar rats, it showed a marked antiulcer activity [24].

1.8 Antifertility

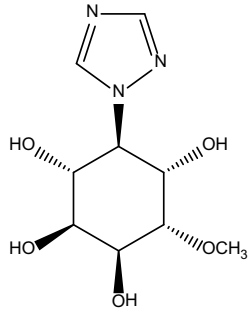
Ethanol extract of *B. spectabilis* showed a reduction in levels testosterone, oestrogen and sperm count, viability, and motility [25].

Table 1: Sources of Natural D-Pinitol and their Pharmacological Activity

S.No.	Source	Activity
1	Leaves of <i>Bougainvillea spectabilis</i>	Anti-diabetic [4]
2	Leaves of <i>Sutherlandia frutescens</i>	Anti-diabetic [26] Anti-cachexial [27]
3	Seeds of <i>Trigonella foenum-graecum</i>	Antioxidant [27]
4	Cladodes of <i>Retama raetam</i>	Antibacterial [28]
5	<i>Glycine max</i> (soybean)	Anti-growth activity [29]
6	<i>Ceratonia siliqua</i> (carob pods)	Natural Inositol [30]
7	Leaves of <i>Dalbergia paniculata</i>	Analgesic, antipyretic and anti-inflammatory activity [31]
8	<i>Sesbania bispinosa</i> (leaves, stems and roots)	Antidiabetic [32]

Azole Nucleosides Derivatives of D-Pinitol are used as Anti-tumour agent. The IUPAC name and the structure of the Azole Nucleosides Derivatives of D-Pinitol are shown in **Table 2**.

Table 2: Azole Nucleosides Derivatives of D-Pinitol [33]

S.No.	Compound	Structure	Activity
1	(1R,2S,3S,4S,5S,6R)-4-methoxy-6-(1H-1,2,4-triazol-1-yl)cyclohexane-1,2,3,5-tetraol		Anti-tumour agent

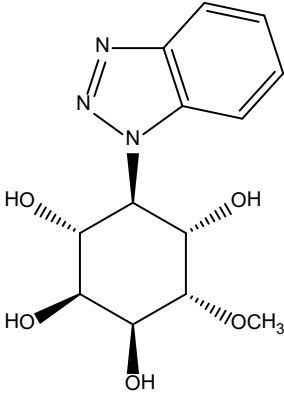
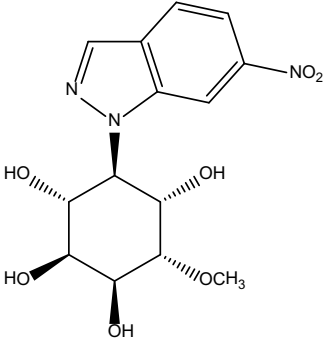
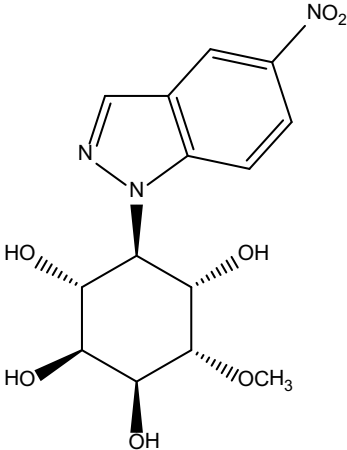
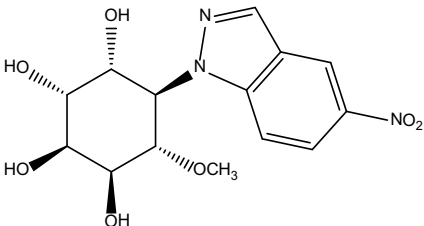
2	(1S,2S,3R,4R,5S,6S)-4-(1H-benzo[d][1,2,3]triazol-1-yl)-6-methoxycyclohexane-1,2,3,5-tetraol		Anti-tumour agent
3	(1R,2S,3S,4S,5S,6R)-4-methoxy-6-(6-nitro-1H-indazol-1-yl)cyclohexane-1,2,3,5-tetraol		Anti-tumour agent
4	(1R,2S,3S,4S,5S,6R)-4-methoxy-6-(5-nitro-1H-indazol-1-yl)cyclohexane-1,2,3,5-tetraol		Anti-tumour agent
5	(1R,2R,3S,4S,5S,6R)-5-methoxy-6-(5-nitro-1H-indazol-1-yl)cyclohexane-1,2,3,4-tetraol		Anti-tumour agent

Table 3: D-Pinitol or Methyl Inositol in Clinical Trial

PHASE	STATUS	CONDITION
2	Completed	Alzheimer's Disease (AD) / Dementia [34]

2. CONCLUSION

d-pinitol is an emerging Phyto molecule which exhibit various pharmacological activities and therapeutic efficacy toward various diseases which makes this molecule as a choice of drug in future for the control of various enlisted disease.

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