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Anti diabetic agent Pinitol from the leaves of *Pisonia grandis* (R.Br.)

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Abstract

Phytochemical investigation of the leaves of *Pisonia grandis* afforded an anti- diabetic compound. Its structure was established as pinitol based on spectroscopic data. It is the first report of isolation of pinitol from *Pisonia genus* and from this species also.

Keywords: *Pisonia grandis*; *Nyctaginaceae*; Pinitol; NMR

1. Introduction

Pisonia grandis R. Br (Family – *Nyctaginaceae;* Vernacular names - Hindi: Chinaisalit, Tamil: Illachaikkattayillai, Maruval, Chandu, Lechai kottai, Telugu: Lanchamundaku, Kannada: Sulesoppu) is widely distributed throughout India and is a widespread evergreen commonly grown lettuce tree especially adapted to sea coasts and grows well in gardens in and around places near the sea, on both east and west coasts[1]. Leaves, stem and root of this species are extensively used by the tribal in the preparation of several folk medicines. It has been extensively used in Indian traditional medicine as an antidiabetic, anti- inflammatory agent, and used in the treatment of analgesia, ulcer, dysentery and snake bite. The leaves are edible and mostly used to treat rheumatism and arthritis. The plant has been studied by different workers with special reference to its pharmacological activity[2-7]. Of significance is a study on the ethanolic extract of *Pisonia grandis* revealed its anti diabetic activity by the reduction in blood sugar level in alloxan induced diabetic rats[8]. Preliminary phytochemical studies indicate the presence of flavanoids, steroids, alkaloids, anthraquinone, tannins and saponins[8].

2.Materials and Methods

Collection of plant material: The plant material (leaves) was collected during January- March 2009 in the local areas of Coimbatore, Tamilnadu, India. The identity of plant material was confirmed at Biodiversity Division, Institute of Forest Genetics & Tree Breeding,

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Coimbatore, South India. The leaves were dried in shade and cut into small pieces and then used for the study.

Preparation of leafextract and chromatographic analysis: Air dried pieces of leaves of *Pisonia grandis* (750 g) were extracted with 100% ethanol for 6 hours at reflux temperature. The extract was filtered; the filtrate was concentrated under vacuum to yield 110 g of residue which was macerated with n-hexane to yield 65 g of hexane-insoluble residue. 35 g of this was subjected to chromatographic separation over a column of silica gel (400 g) built in chloroform. The column was eluted with chloroform and chloroform-methanol mixtures with increasing amounts of methanol.

3.Results

Pinitol was isolated from the chloroform: methanol (97:3) eluate of the column.

MP: 184-191°C

$[\alpha]_D$: +56° (water)

R_f: 0.72 ($CHCl_3$-MeOH-Water 9:1:0.5 ml)

IR (KBr): 3401,3318,2950,2909,1455,1125, 1072,700, 675 cm^{-1} (Fig.1)

^1H NMR (400 MHz, DMSO-d_6): δ 4.71 (1H, s C-5,OH),4.62 (1H, s, C-3,OH), 4.50-4.51 (1H, d, C-6,OH), 4.45-4.47 (1H, d,C-2,OH), 4.33 (1H, d, C-4,OH), 3.66 (1H,br.s, H-5), 3,62 (1H.br.s,H-3), 3.49-3.52, (1H,br.s,H-2), 3.44 (4H, intense broad signal, OMe and H-4,),

3.32-3.35 (1H,m,H-6), 2.98-3.02 (1H,t, H-1) (Fig.2)

^{13}C NMR (100 MHz DMSO-d_6):δ 84.2 (CH, C-1), 73.0 (CH,C-6), 72.9 (CH, C-3), 72.4 (CH,C-5), 71.6 (CH, C-4), 70.5 (CH,C-2), 60.1(OMe,C-1) (Fig.3)

Yield: 144mg

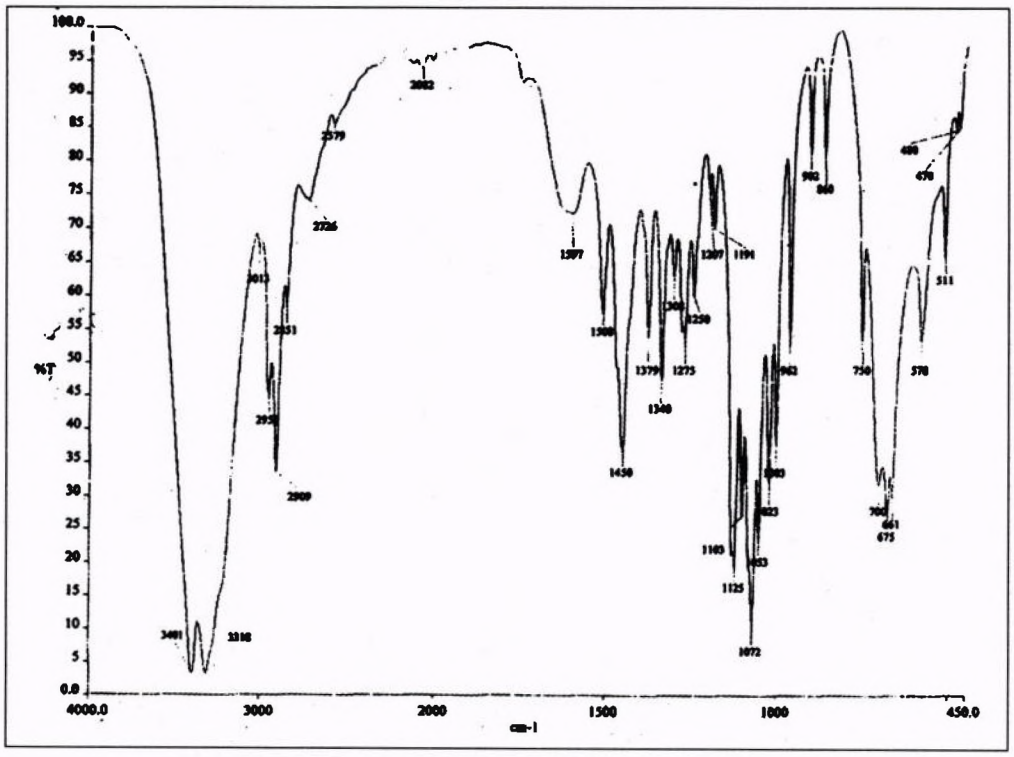

Fig1. IR spectrum of Pinitol

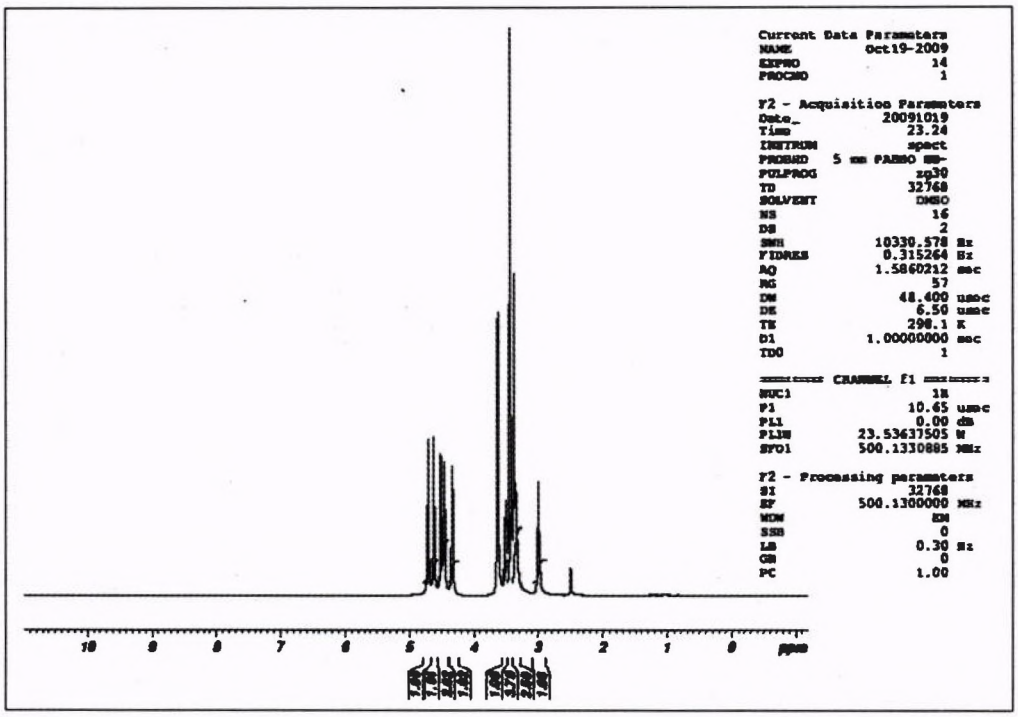

Fig 2. ^{1}H NMR spectrum of Pinitol

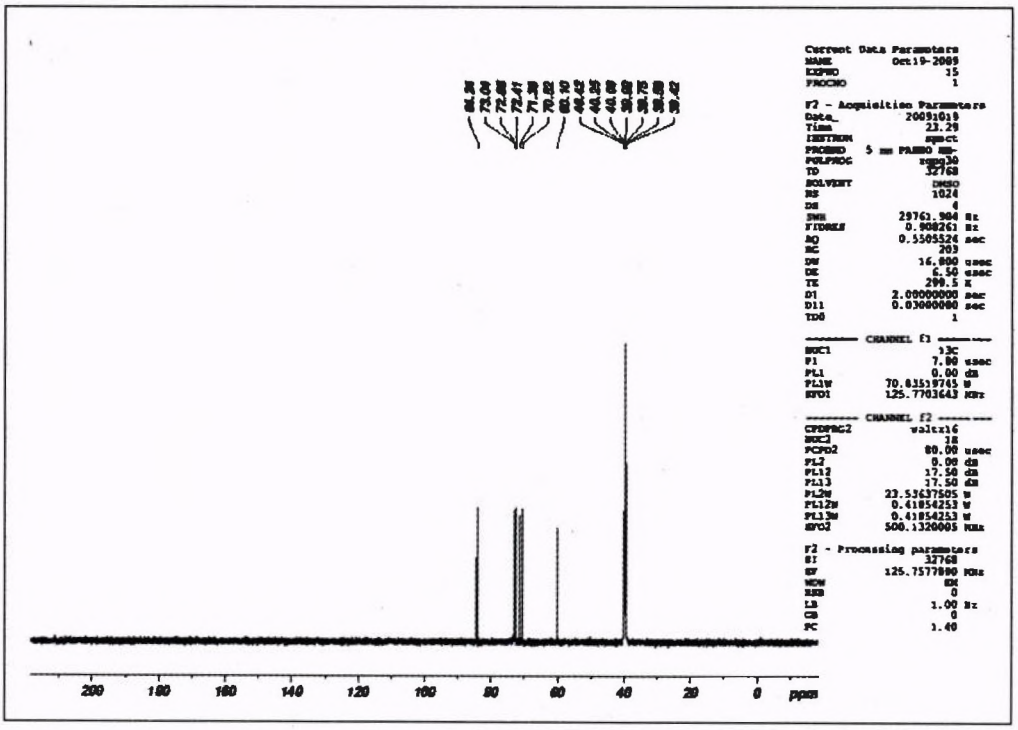

Fig 3. ^{13}C NMR spectrum of Pinitol

4.Discussion

Pinitol is a common constituent of legume plants and is a major component of soybean (*Glycine max* L Merr)[9]. Earlier isolated from pine tree (*Pinus lambertiana*)[10], *Gliricidia sepium*[11] and *Bougainvillea spectabilis* [12,13] more recently pinitol has been reported from many other plants also[14-18]. The hypoglycemic action[12] and antihyperlipidemic effect[19] of pinitol have been well established. Clinical trials on the effect of pinitol on glycaemic control and cardiovascular risk factors in patients with type II diabetes mellitus have been successfully carried out[20,21]. Pinitol is reported safe and nontoxic as an antidiabetic agent even at high levels[22]. It is noteworthy that pinitol, with such pharmacological importance is isolated for the first time from *Pisonia genus* and from the medicinal plant *Pisonia grandis* (patent pending No.385/CHE/2010). The anti diabetic nature of *Pisonia grandis* may be due largely to the presence of this particular compound in this plant.

5.Acknowledgment

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