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Isolation and characterization of new plant pigment along with three known compounds from *Butea monosperma* petals

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ABSTRACT

A new compound lanceoletin along with three known compounds butein, monospermoside and sulfurein have been isolated from Butea monosperma petals. Compounds structure was elucidated with the help of chemical data and spectral studies.

Key words: *Butea monosperma*; lanceoletin; butein; monospermoside; sulphurin

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INTRODUCTION

Butea – monosperma (Family: Fabaceae) [1, 2] is a medium sized deciduous tree, widely distributed in tropical Asia up to an altitude of 4000ft. It grows on open grass lands and scattered in mixed forest. *Butea monosperma* [3, 4] (Local name: Flame of the forest or Tessu) is used for timber, resin, fodder, medicine and dye. The flowers of this species appear in February and stay on nearly up to the end of April. The size is nearly 2 to 4 cm. in diameter. These tend to be densely crowded on leafless bunches. The flowers from gorgeous canopy on the upper portion of the tree, give the appearance of a flame from a distance. Flowers of these plants are important source of natural dye.

MATERIALS AND METHODS

The fresh flowers of *Butea monosperma* [5] (1 Kg) were collected from natural sources and identified by taxonomist. The flowers[6] were dried under shade and pulverized in the wiley mill to powdered form. The air dried and crushed powder of *Butea monosperma* [7-9] petals was repeatedly extracted by using the various solvent systems under cold and hot percolation techniques. Cold percolation was done using three different solvent systems namely 100% water, 100% ethanol, 50% water + 50% ethanol. Maximum yield obtained with cold percolation was

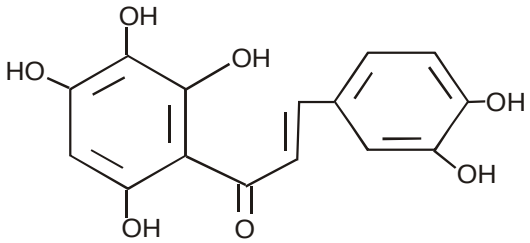
3.6%. Because of fewer yields, extracts obtained from cold percolation were not taken for further process.

Hot percolation was done in soxhlet extractor using hexane, benzene, chloroform and methanol solvents in an increasing polarity. The total percentage was found to be 19.48%. The best result was obtained with methanol (9.6%). Methanol extract was concentrated under reduced pressure in a rotatory evaporator till the weight of concentrated extract became 4g. The crude dye extract obtained by methanolic extraction was subjected to preparative TLC using chloroform: benzene: methanol (15: 2: 3) solvent systems. Four bands B-1, B-2, B-3 and B-4 obtained in preparative TLC indicated the presence of four compounds. The methanolic extract of individual bands was concentrated and tested for purity using thin layer chromatography. The Rf values of B-1, B-2, B-3 and B-4 were 0.63, 0.55, 0.23 and 0.13 respectively. After isolation characterization of all compounds carried out using spectral technique.

RESULTS AND DISCUSSION

COMPOUND B-1

It was obtained as amorphous yellow powder (300 mg), Rf - 0.63 (chloroform: benzene: methanol, 15:2:3), red colour with aqueous NaOH indicated the presence of chalcone aglycone. UV(MeOH): 233, 276 and 371nm; IR (KBr/cm^{-1}) 3393 (chelated -OH group) 2372, 1597, 767 (phenolic-OH group), 1640cm^{-1} (>C=O of chalcones); 1H NMR signals at δ 6.26 to 7.68 (aromatic protons), δ 4.908 to5.316. Molecular ion peak appeared at m/z 272. It also showed mass peaks at 255 (M-OH), 227 (255 - > C = O), 213 (227-CH_2) further confirm the structure. From the structural data and colour reaction. It is confirmed that B-1 is butein having the following structure (Fig.-1).

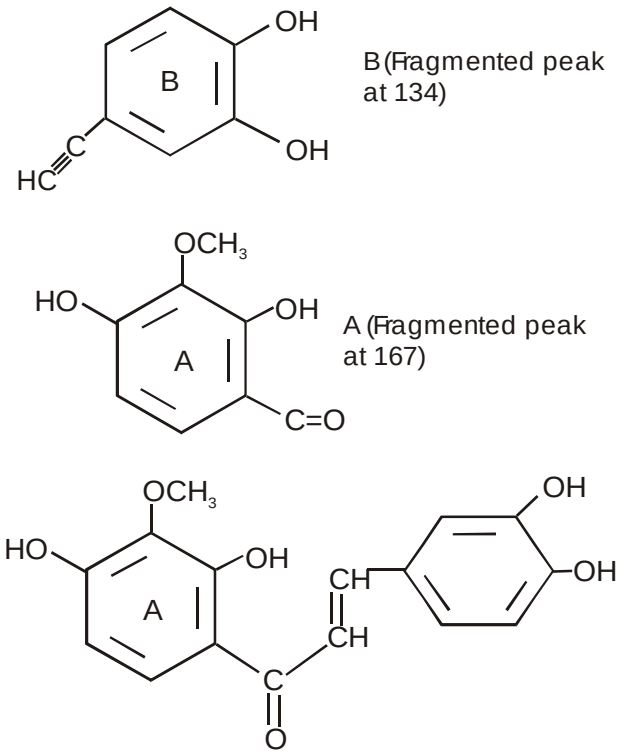


Butein

Fig.1: Compound B-1

COMPOUND B-2

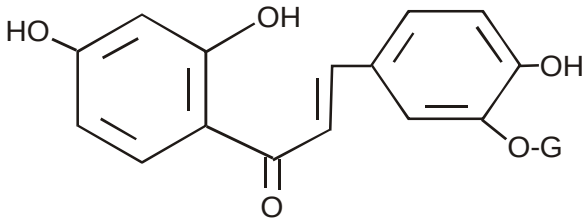
Concentrations of methanolic elute of band B-2 afforded yellowish amorphous powder (800mg). Red colour with aqueous NaOH , R_f - 0.55 (chloroform: benzene: methanol, 15:2:3). UV (MeOH): 215, 275 and 356 nm (hydroxy chalcone). IR (KBr/cm^{-1}) υ_{max}^{KBr} 3400 (chelated - OH group), 1610 (> C=O group), 2401 and 759cm^{-1} (phenolic-OH groups).The expended ^{1}H NMR signal at δ 3.306 (-OCH_3) δ 4.8 (-CH=CH-) and aromatic protons at δ 6.3 to 7.8 ppm. MS at m/z 302 ($C_{16}H_{14}O_6$), other fragmentations peaks at m/z 284 (M-18), 253 {M-(OH + CH_3)} and two ring fragmentation peaks at 167 (A ring with two hydroxyl and one methoxyl group) and at one 134 (B ring with two hydroxyl group) (Fig.-2).



Lanceoletin
Fig.2: Compound B-2

COMPOUND B-3

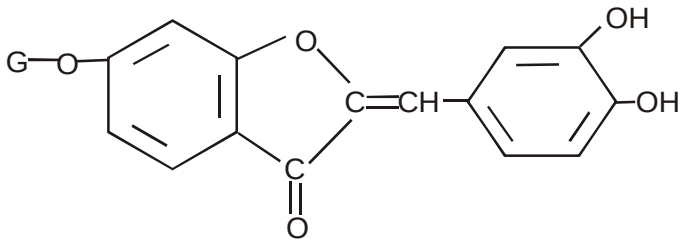
It was obtained as yellowish red amorphous solid (550 mg) which gave brown colour with aqueous $FeCl_3$ and deep yellow colour with aqueous NaOH, Rf- 0.23. UV (MeOH): 370 and 310 nm; IR (KBr) 3395 (chelated-OH group), 2925 and 760 (phenol-OH group), 1645 cm^{-1} (>C=o group); 1H NMR showed glycosidic 6 protons between 3.3-3.92 ppm H-1 glycosyl proton at 4.8 to 5.3 ppm. The aromatic proton appears at δ 6.16-7.68 (H-6). MS (low intensity molecular ion peak) at m/z 432 due to rapid loss of sugar from the parent molecule. This was followed by strong peak to m/z 415 (M-OH), 368 {M-(OH+CH_2OH}, 256 (M-hexose). Form the above spectral data and colour reaction; it is evident that compound B-3 is Monospermoside having the structure (Fig.-3).



Monospermoside
Fig.3: Compound B-3

COMPOUND B-4

It was obtained as yellow sticky solid (100 mg.), R_f - 0.13, gave purple colour with aqueous NaOH. The UV (MeOH): 240 and 408 nm (aurone); IR (KBr/cm^{-1}) : 3399 (chelated-OH group), 1630 (>C=O group) 2368 and 760 $cm.^{-1}$ (phenolic-OH group); The ^1H NMR signals at δ 6.78 corresponding to benzylic proton of the aurone ring. Other aromatic protons appeared between 6.3-7.9 ppm. The six glycosidal protons at δ 3.32 to 3.90, the H-1 glycosyl proton at 4.9-5.3 ppm. MS (very low intensity molecular ion peak) at m/z 432 corresponding to molecular formula ($C_{21}H_{20}O_{10}$) followed by fragmentation peak at m/z 368 (M-64), 303 (M-129), 269 (M-glucose), 227 (269-CO+CH2), strong peak at m/z 137 corresponding to fragmentation A[10]: (Fig.-4).



Sulfurein

Fig.4: Compound B-4

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