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Research Article

Phytochemical Examination of *Corchorus fascicularis* Roots

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ABSTACT

From the root extract of *Corchorus fascicularis*, β-sitosterol, lupeol, kaempferol, quercetin, oleanolic acid, 2-methylanthraquinone and fusidic acid were isolated and characterized by spectroscopy.

Key words: *Corchorus fascicularis* ,β-sitosterol, lupeol, kaempferol, quercetin, oleanolic acid, 2-methyl anthrquinone and fusidic acid

INTRODUCTION

Corchorus fascicularis L. belongs to the family Tiliaceae, and is an annual herb with woody base to 1 m, leaves are 3.1–4.6 cm long, 0.5–2.1 cm wide, capsule are 1.1–1.5 cm long, to 0.2 cm wide [1]. *Corchorus fascicularis* is reported to have the spasmolytic effect against acetylcholine, histamine and bradykinin [2]. Earlier, only betulinic acid and β-sitosterol were isolated from this plant [3- 6].

Plant Material: The roots of *corchorus fascicularis* (1kg) were collected from Warangal in September 2007. The plant was authenticated by Prof.V.S. Raju, Depatment of Botany, Kakatiya University,Warangal

Extraction: The air dried roots of *Corchorus fascicularis* (1kg) was coarsely powdered and extracted with petroleum ether (3 L), chloroform (4 L) and methanol (3 L) sucessively in a soxhlet extractor for 15hrs and concentrated. The petroleum ether, chloroform concentrates of *Corchorus fascicularis* were found similar on TLC (1:1 Benzene: Chloroform) and hence combined and column chromatographed. The chromatography of the combined extracts gave four compounds CFR-1, CFR-2, CFR-3 and CFR-4. The methanolic concentrate of *Corchorus fascicularis* yielded on chromatography these pure compounds named as CFR-5, CFR-6 and CFR-7.

Characterization of the Isolated Compounds:

CFR-1(β-sitosterol, 20mg): The compound was crystalized from petroleum ether as a colorless needles, m.p 136-138°C. It showed color reaction for sterols with Liebermann-Burchard test.The UV (MeOH) *λmax* 205 nm; EIMS *m/z* 414 [M]+(calc. for $C_{29}H_{50}O$). ^{1}H NMR ($CDCI_3$, 400 MHz): *δH*3.52 (1H, *m*, H-3), 5.35 (1H, *m*, H-6), 0.68 (3H, *s*, Me-18), 0.98 (3H, *s*, Me-19), 0.91 (3H, *d*, *J* = 6.4 Hz, Me-21), 0.83 (3H, *d*, *J* = 6.8 Hz, Me-26), 0.81 (3H, *d*, *J* = 6.9 Hz, Me-27), 0.85 (3H, *t*, *J* = 7.8 Hz, Me-29). ^{13}C NMR (CDCI3, 100 MHz): *δC*37.4 (C-1), 31.8 (C-2), 72.0 (C-3), 42.5 (C-4), 140.9 (C-5), 121.9 (C-6), 32.1 (C-7), 29.9 (C-8), 50.3 (C-9), 36.7 (C-10), 21.3 (C-11), 40.0 (C-12), 42.5 (C-13), 56.9 (C-14), 24.5 (C-15), 28.4 (C-16), 56.2 (C-17), 12.0 (C-18), 19.6 (C-19), 36.3 (C-20), 19.0 (C-21), 34.1 (C-22), 26.3 (C-23), 46.0 (C-24), 29.3 (C-25), 20.0 (C-26), 19.2 (C-27), 23.2 (C-28), 12.2 (C-29). Based on the above data, the compound was identified as β-sitosterol

CFR-2 (Lupeol, 30mg): The compound was crystallized from hexane as colourless needles, m.p. 212-214^{0}C, $[\sim]_D^{30}$ + 38° (C, 1.12 in chloroform) and analyzed for the formula $C_{30}H_{50}O$. It gave pink colour with L.B. reaction indicating that the compound was a triterpenoid. The IR spectrum showed bands at 3540 cm^{-1}– OH absorption, 1380 and 1390 cm^{-1} (*gem*- methyls) and at 890 cm^{-1} (vinyl methylene). ^{1}H NMR spectrum ($CDCl_3$, 90 MHz, δ) showed peaks at 0.76 (d, 3H); 0.78, 0.80, 0.90, 1.02 (s,15H); 1.63 (s, 3H); 0.91 (s, 6H) and δ 3.18 (m, 1H). From the above properties **CFR-2** was identified as lupeol and the identity was confirmed by comparison with authentic sample (m.m.p. and co-TLC).

CFR-3 (Kaempferol, 25mg): It was obtained in the methanol: chloroform (1:99) fraction and crystallized from methanol as yellow needles, m.p. 279-280^0 C and analyzed for the formula $C_{15}H_{10}O_6$. In U.V light, it showed a single yellow spot and on exposing to ammonia it turned to bright yellow. It gave positive colour reactions characteristic for flavonols. An orange red precipitate with neutral lead acetate and an yellow colour with Wilson's citric -boric acid reagent confirmed the presence of a free 3-hydroxyl and 5- hydroxyl groupings respectively. It formed a tetra acetate, m.p. 186-188^0 and a tetra methyl ether, m.p. 163-164^0 C .The ultra violet spectrum in methanol had absorptions at λ_{max}^{MeOH} 253sh, 265, 294sh, 322sh, 365nm. Sodium acetate gave 10 nm bathochromic shift in Band II indicating the presence of a free 7- hydroxyl. With aluminium chloride / HCl, it formed a complex and showed a shift of 55 nm in Band I which further confirmed the presence of 3-OH group. NaOAC / H_3BO_3 reagent did not give any pronounced shift which suggested the absence of a free ortho-dihydroxy system. From the above

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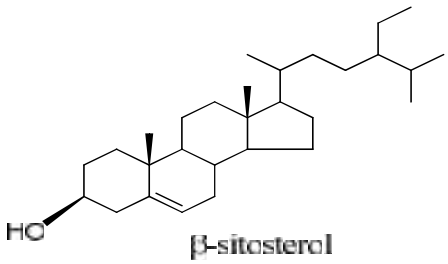
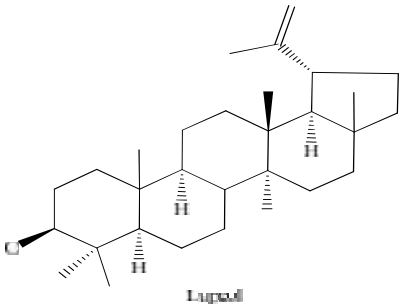
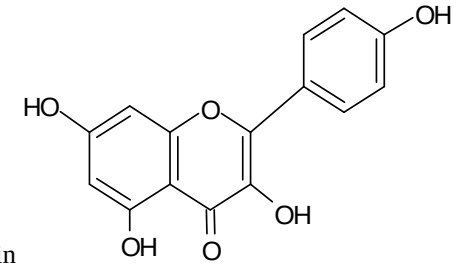


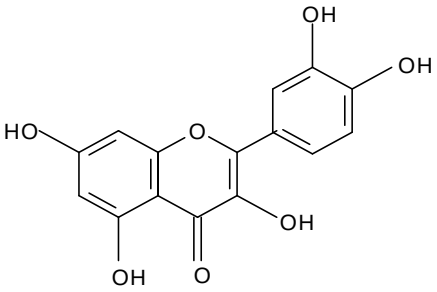
β-sitosterol



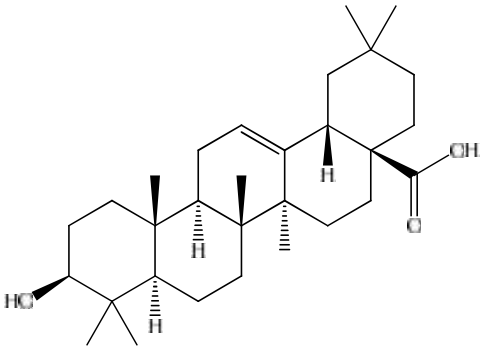
Lupeol



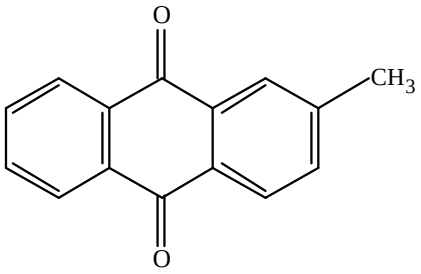
Quercetin



Kaempferol



Oleanolic acid



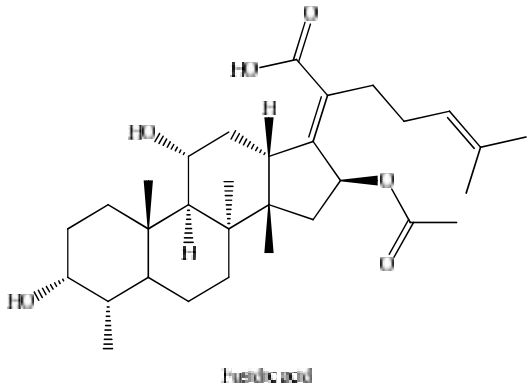
2-Methyl anthraquinone

properties compound CFR-3 was identified as Kaempferol and the identity was confirmed by comparison with an authentic sample (mmp and co-PC) [7, 5].

CFR-4 (Quercetin, 22mg): The compound was obtained from the methanol-chloroform mixture and was crystallized from methanol as yellow crystalline solid, melting point 312-314ºC and analyzed for the formula $C_{15}H_{10}O_7$. On paper chromatography it was yellow and intense yellow under U.V/NH_3, with ferric chloride it gave green colour, characteristic for flavonoids, an orange red precipitate, with neutral lead acetate indicating the presence of free 3-hydroxyl group. The U.V spectrum in ethanol shows absorptions at λ^{EtOH}_{max} 255, 267sh, 301sh, 374 nm. It gave 10nm bathochromic shift in band-II indicating the presence of a free 7-hydroxy group, and with aluminum chloride, it formed a complex and showed a shift of 55nm band-I further which confirmed the presence of a free 3-hydroxyl group. Using Sodium acetate, boric acid reagent showed a bathochromic shift of 20nm indicating the presence of free 3', 4' – di hydroxyl groups (ortho dihydroxy system). ^{1}HNMR exhibits peaks at δ 7.60 (d, 6'H) and δ 7.75 (d, 2'H). From the above properties CFR-4 was identified as Quercetin and its identity was confirmed by comparison with an authentic sample (m.m.p and Co - T.L.C).[8, 9]

CFR-5 (Oleanolic acid, 26 mg): The compound was crystallized from methanol as white flakes, 271-273°. UV (MeOH) *λmax*215 nm; EIMS *m/z* 456 [M]+(calc. for $C_{30}H_{48}O_3$). ^{1}H NMR ($CDCI_3$, 400 MHz): *δH*5.24 (1H, *t*, *J* = 3.6 Hz, H-12), 3.21 (1H, *dd*, *J* = 10.2/4.4 Hz, H-3), 2.82 (1H, *dd*, *J* = 12.7/4.3 Hz, H-18), 0.96 (3H, *s*, Me-23), 0.78 (3H, *s*, Me-24), 0.84 (3H, *s*, Me-25), 0.76 (3H, *s*, Me-26), 1.25 (3H, *s*, Me-27), 0.87 (3H, *s*, Me-29), 0.93 (3H, *s*, Me-30). ^{13}C NMR ($CDCI_3$, 100 MHz): *δC*38.6 (C-1), 26.7 (C-2), 78.5 (C-3), 39.2 (C-4), 55.5 (C-5), 18.3 (C-6), 32.6 (C-7), 39.6 (C-8), 48.1 (C-9), 37.0 (C-10), 22.7 (C-11), 122.4 (C-12), 144.1 (C-13), 42.0 (C-14), 27.7 (C-15), 22.8 (C-16), 46.7 (C-17), 41.5 (C-18), 46.1 (C-19), 30.4 (C-20), 33.7 (C-21), 32.3 (C-22), 28.8 (C-23), 14.7 (C-24), 15.1 (C-25), 16.5 (C-26), 25.2 (C-27), 180.4 (C-28), 32.8 (C-29), 23.3 (C-30) [7, 10-15]. Based on chemical tests and spectral data the compound was identified as oleanolic acid.

CFR-6 (2-methylanthraquinone, 60mg): It was obtained as an yellow solid, crystallized as needles in methanol: chloroform mixture. Mp 170 - 173º C. It gave pink colour with Kedde's reagent indicating that the compound may be an anthraquinone Rf 0.72 in $CDCl_3$: MeOH (19:1) and Rf 0.37 in petroleum ether : acetone : acetic acid (75:25:1.5) and ^{1}HNMR and ^{13}CNMR data ^{1}H NMR (250 MHz, $CDCl_3$) : 2.47 (3H, s, $–CH_3$), 7.53, (1H,d, J=7.8 Hz, H-3), 7.71–7.73 (2H, m, H-5, 8), 8.04 (1H,s ,H-1), 8.14 (1H, d, J = 7.8 Hz, H-4), 8.23–8.25 (2H, m, H-6, 7). ^{13} C-NMR**:** (125 MHz, $CDCl_3$): 127.8 (C-1), 145.5 (C-2), 135.3 (C-3),



Fusidic acid

127.7 (C-4), 127.4 (C-5), 134.3 (C-6), 134.2 (C-7), 127.5 (C-8), 183.7 (C-9), 183.3 (C-10), 22.1 (CH_3). The data corresponded well with that of 2-methylanthraquinones and further confirmed by comparision with an authentic sample by m.m.p and co-TLC.This is the first report of this compound from *C.fascicularis* and particularly from the genus *Corchorus.*

CFR-7 (Fusidic acid, 40mg): It was obtained as a white solid, m.p.190-192^{0}C. The chemical tests and other spectral data (^{1}H and ^{13}C NMR and Mass) coinsided well with the data of fusidic acid. Which was also isolated from *Corchorus olitorius* and *Corchorus aestuans* [16-42] and hence compound CFR-7 was identified as fusidic acid.

RESULT AND DISCUSSION

The *Corchorus* species were also known as jute plants and are commercially used. But the literature indicates the presence of very important secondary metabolites like Cardiac glycosides in *corchorus* genus. Earlier from some of the *corchorus* species, cardiac principles like Corchoroside-A, Corchoroside-B, Corchoroside-C, Corchoroside-D, Corchoroside-E and Corchoroside-F were reported and are more potent than Digitalis glycosides. With this in view, the author has examined the *Corchorus fascicularis* and isolated β-sitosterol, lupeol, quercetin, kaempferol, oleanolic acid, 2-methylanthraquinone and fusidic acid. But no cardiac glycosides were found in *Corchorus fascicularis.*

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REFERENCES

1. C.P. Khare (Ed.), *Indian Medicinal Plants An Illustrated Dictionary*, Springer-Verlag Berlin/Heidelberg.
2. Whitehouse, C. Cheek, M .Andrews, S and B verdcourt, *Flora of tropical east africa*,2001
3. Kapoor ,S .K. Ahmad ,P. I. and Zaman ,A., *Indian J Appl Chem*,1971; 34, 237
4. Tariq ,M. Bhardwaj ,S. L. Sharma ,R. C. Gupta,S .K. Gupta, L., *Indian J Exp Biol*,1973; 11,248- 249.
5. Azuma, K. Nakayama,M. Koshioka, M. Ippoushi, K. Yamaguchi ,Y. Kohata Yuji Yamauchi K, Ito ,H. Higashio, H., *J. Agric. Food Chem*, 1999;47, 3963–3966.
6. Mukherjee, K.K.Mitra, S.K. and Ganguly, S.N., *Natural Product Science*, 1998; 4, 51–52.
7. Kohda, H. Tanaka, S. Yamaoka, Y. Moringa ,S. Ohara ,Y., *Nat Med*, 1994; 48,213- 214.
8. EI Sayed, K. A, Halim, A.F. Zaghloul,A.M. Voehler, M. International Conference on Chemistry and its Role in Development, Faculty of Science , Mansoura University, 1994.
9. Adeyemi, M.M, D.A. Adebote, J.O. Amupitan, A.O. Oyewale and A.S. Agbaji., A*ustralian Journal of Basic and Applied Sciences*, 2010*;* 4(8): 3342-3346.
10. Z¨uhal g¨uvenalp, Nurcan kili, Cavit kazaz, Yusuf kaya, l ¨om¨ur dem˙irezer, *Turk J Chem*, 2006; 0, 515 – 523.
11. [11]Laurence Voutquenne, Pauline Guinot, Odile Thoison, *Phytochemistry*, 2003; 64,781– 789
12. Vassiliki,G. Kontogianni, Vassiliki Exarchou, Anastassios Troganis, Ioannis P., *Analytica Chimic aActa*,2009; 635, 2, 188-195.
13. Laxminarain , M.and Laatsch, H., *Phytochemistry*,54, 8, 2000, 969-974
14. Shigeru Sakai, Masumi Katsumata (Nee Ohtsuka), Yohko Satoh, Miki Nagasao, Masazumi Miyakoshi, Yoshiteru Ida, Junzo Shoji, *Phytochemistry*, 1994;35, 5, 1319- 1324 .
15. Risom, T. Jakobsen, H .J. Rastrup-Andersen, N .and Lorck, H., *Tetrahedron Letters*, 1974; 15(26), 2247-2250
16. Loshkarev, P.M., *Aromat Rast*, 1969; 15,618-628.
17. Ferrari, G. and Casagrande, C., *Chem Abstr*, 1969; 70, 38053.
18. Rao, E. V. Rao, K .N. and Rao ,D. V., *Indian J Pharm*,1972; 34,168
19. Yukihiro, G. Takatoshi N, Shinobu S, Hiroshi M, Kazunari K, Hiroshi A and Masatake T, *Tennen Yuki Kagobutsa Toronkai Koen Yoshishu*, 1998; 40, 371-376.
20. Takatoshi, N. Yukihiro,G. Shinobu ,S.Kazunari, K. Hiroshi, A. and Masatake, T., *Phytochemistry*,1998; 49,2097-2101.
21. Yoshikawa, M. Murakami, T. Shimada, H. Fukada,N. Matsuda ,H. Sashida, Y. andYamahara J., *Heterocycles*,1998; 48,869-873.
22. Yukhihiro, G. Shinobu, S. Takatoshi, N. Hiroshi, A. and Masatake, T., *J Food Hyg Soc Japan*, 1998; 39,256-265.
23. Rao, D. V. and Rao, E. V., *Phytochemistry*, 1975; 14, 533-537.
24. Rao, E .V. Rao, D. V. Pavanaram, S. K. Von, E. J .and Reichstein T., *Helv Chim Acta*, 1971; 54, 1960-1968.
25. Qudrate- i- Khuda, M. Khalique,A. and Das,D. C., *Sci Res*,1965; 2,152-159.
26. Ohtani, K.Okai, K. Yamashita, U. Yuasa, I.and Misaki, A., *Biosci Biotechnol Biochem*, 1995; 59,378-381.

27. Kohda, H. Tanaka ,S. Yamaoka ,Y. Moringa, S. Ohara, Y., *Nat Med*, 1994; 48,213- 214.
28. Yoshikawa, M. Shimada, H. Saka, M. Yoshizumi, S. Yamahara, J. and Matsuda H., *Chem Pharm Bull*, 1997; 45,464-469.
29. Azuma, K. Nakayama ,K. Koshioka ,M. Ippoushi, K. Yamaguchi, Y. Kohata, K.Yamauchi ,Y. Ito, H .and Higashio, H., *J AgricFood Chem*, 1999; 47, 3963-3966.
30. Mukherjee, K. K. Mitra, S. K. and Ganguly, S.N., *Nat Prod Sci*, 1998; 4, 51-52.
31. Soliman, G. and Saleh,W. *J., Chem Soc*,1954; 1506-1508.
32. Sen Gupta, A .and Mazumder,U. K., *J Sci Food and Agr*, 1973; 24,1391- 1395.
33. Yoshikawa, M. Murakami, T. Shimada, H. Yoshizumi, S. Saka ,M. Yamahara, J., *Chem Pharm Bull*, 1988; 46,1008-1014.
34. Schumersahl, P., *Arch Pharm Ber Deutsch Pharm Ges*, 1971; 304,307-314.
35. Leshchinskii L A, Karbasnikova G V, Zebelyan O M and Vasilkova A A., *Kardiologiya*,1978; 18,76-83.
36. Khatib S, Alkofahi A, Hasan M, Najib N and El- oqlah A., *Biomedical Letters*, 1998; 57,147-152.
37. Laskar, S. Majumde, S .G. Basak, B .and Dey ,C. D., *Physiol Bohemoslov*, 1986;35,86-89.
38. Innami, S.Tabata, K.Shimizu, J.Kusunoki, K.Ishida,H. Matsuguma,M. Wada, M. Sugiyama, N. and Kondo, M., *Plant foods Hum Nutr*,1998; 52,55-65.
39. Mazumder, U .K. Gupta, M. Pal, D. K .and Bhattacharya, S., *Acta Pol Pharm*, 2003; 60, 317-323.
40. Gupta, M. Mazumder, U.K. Pal, D.K. Bhattacharya, S .and Chakrabarty, S., *Acta Pol Pharm*, 2003; 60,207-210.
41. Gupta, M. Mazumder, U. K. Pal, D. K. and Bhattacharya, S., *J, Ethnopharmacol*, 2003; 89, 55-59.
42. Gupta, M. Mazumder,U .K. Pal ,D. K .and Bhattacharya ,S., *Ind.J.Exp Biol*,2003; 41, 641-644