Chemical Investigation of Indigenous Drug (*Alhagi pseudalhagi*)

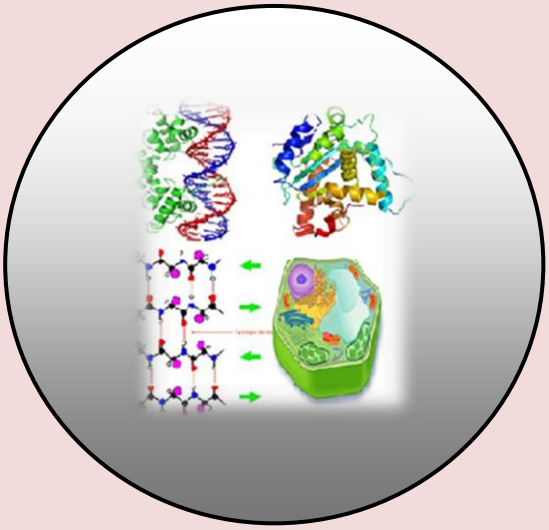
By

Bineeta Yadav

ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

UGC Approved Journal No. 62923
MCI Validated Journal
Index Copernicus International Value
IC Value of Journal 82.43 Poland, Europe (2016)
Journal Impact Factor: 4.275
Global Impact factor of Journal: 0.876
Scientific Journals Impact Factor: 3.285
InfoBase Impact Factor: 3.66

J. Biol. Chem. Research
Volume 36 (1), Part C, 2019 Pages No. 242-245



Journal of Biological and Chemical Research

An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

Indexed, Abstracted and Cited in various International and National Scientific Databases

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 36, No. 1: Part C, 242-245, 2019
(An International Peer Reviewed / Refereed Journal of
Life Sciences and Chemistry)
Ms 36/02/0620/2019

ISSN 2319-3077 (Online/Electronic)
ISSN 0970-4973 (Print)

Dr. BineetaYadav
http:// www.sasjournals.com
http:// www.jbcr.co.in
jbiolchemres@gmail.com

RESEARCH PAPER

Received: 29/04/2019 Revised: 01/06/2019 Accepted: 02/06/2019

Chemical Investigation of Indigenous Drug (*Alhagi pseudalhagi*)

Bineeta Yadav

Department of Chemistry, D.A.V. Degree College, Lucknow, U.P., India

ABSTRACT

From the whole plant of Alhagi pseudalhagi (Bieb.) Desv. (Leguminosae), three alkaloids, two steroids, two flavonoids and three flavonoids glucosides were isolated. The compounds were identified by m. p. of the parent compounds and their derivatives where possible, co- TLC with authentic samples and spectral properties. The alkaloids are protopine, apocavidine and demethylcorydalmine, steroids are β-sitosterol and sitosterolglucoside. The flavonoids are apigenin and naringenin and the flavonoids glucosides are naringenin-5-methyl ether-4'-O-D-glucoside, hesperidin and alhagidin.

Keywords: Alhagi pseudalhagi, Leguminosae, Alkaloids, Antiprotozoal and Apigenin.

INTRODUCTION

Alhagi pseudalhagi (Bieb.) Desv. (Family: Leguminosae) is a shrub distributed throughout India. The herb is bitter, diaphoretic, diuretic and is used as antirheumatic, antibacterial, antiprotozoal, antiarrhythmic, spasmolytic and anticancer in Indian system of Medicine. A number of chemical constituents eg: alkaloids, flavonoids, steroids, glycerides, fatty acids have earlier been reported from this species. In view of the above facts, a detailed chemical investigation of *A. pseudalhagi* was taken up by the present investigator to isolate and characterize further chemical constituents.

MATERIAL AND METHODS

Air dried powdered whole plant of *A. pseudalhagi* (3 kg) was extracted with MeOH and alkaloidal and non-alkaloid fractions were separated from MeOH extract by usual procedure. Chromatographic resolution of the alkaloidal fraction over silica gel column resulted in the isolation of three alkaloids which were provisionally designated as Ap-1, Ap-2 and Ap-3. Chromatographic resolution of the non-alkaloidal fraction resulted in the isolation of two compounds designated Ap-4 and Ap-5.

Ap-1, colorless granules m.p. 204-07°C, $C_{20}H_9NO_5$(m/z 353.1244M^+, HRMS), Ap-2, colorless granules 168-70°C, $[\alpha]_D^{20}$ ± 0° (c, 1.40, $CHCl_3$), $C_{20}H_{21}NO_4$ (m/z 339.1478, M^+, HRMS); Ap-3 colorless granules

m.p. 140°, , $[\alpha]_D^{20}$ ± 0° (c, 1.32, $CHCl_3$), $C_{19}H_{21}NO_4$ (m/z 327.1465, M^+,HRMS); Ap-4, colorless needles, m.p. 135-37, $C_{29}H_{50}O$ (m/z 414, M^+) and Ap-5 colorless granules; m.p. 286-88° (dec.), $C_{35}H_{60}O_6$were characterized as protopine, apocavidine, demethylcorydalmine, β-sitosterol and sitosterolglucoside respectively by a study of the spectral data and also by direct comparison with authentic samples. This is the first report of these compounds in A. pseudalhagi, except β-sitosterol.

Air dried powdered whole plant of A. pseudalhagi (2.5 kg) was further extracted with MeOH and chromatographic resolution of the methanolic extract resulted in the isolation of five compounds which were provisionally designated as Ap-6, Ap-7, Ap-8, Ap-9 and Ap-10. Ap-6, yellow granules, m.p. 345-47°C, $C_{15}H_{10}O_5$(m/z 270, M^+,);Ap-7, dirty granules, m.p. 257-59°C, $C_{15}H_{12}O_5$ (m/z 272, M^+) and Ap-9 m.p. 219-21°, $C_{28}H_{34}O_{15}$ (m/z 611, M^++ H) were characterized as apigenin, naringenin and hesperidin by study of chemical and spectral analysis and also by direct comparison with authentic sample. These compounds have not earlier been reported from this plant.

Ap-8, crystallized as yellow granules, m.p. 211-12°C, $C_{22}H_{24}O_{10}$ (m/z, 449, M^++H) showed characteristic UV absorption maxima at $\boldsymbol{\lambda}_{max}$ 287 and 325 shlike that of flavanone nucleus. IR spectrum showed absorption band for hydroxyl and carbonyl groups. Acid hydrolysis furnished an aglycone and D- glucose (Co-P.C.). The aglycone, colourless needles, m.p. 257-59°C $C_{16}H_{14}O_5$ was identified as naringenin-5-methyl ether by a study of IR, UV, ^{1}H NMR, ^{13}C NMR, HRMS data and also by direct comparison with authentic sample.

^{13}C NMR of Ap-8 exhibited only one anomeric proton at 101.4 indicated the presence of one sugar unit in Ap-8, which was supported FAB-mass spectrum exhibiting molecular ion peak at m/z 449 (M^+ + H). ^{13}C NMR carbon signals of Ap-8 were identical to one mole of naringenin-5- methyl ether and one mole of D-glucose units. The position of attachment of glucose unit with naringenin-5-methylether was achieved by UV spectrum with shift reagent. The UV spectrum of Ap-8 showed bathochromic shift of 10 nm with NaOAc but no bathochromic shift was observed with NaOMe. This clearly indicated a free-OH group at C-7 and no free -OH group at C-4' position. Hence it is concluded that the glucose unit is attached at C-4' position in Ap-8. This is a new flanvanone glycoside, not earlier been reported in literature.

Ap-10.buffcoloured granules, m.p. 316-19°C, $C_{34}H_{24}O_{21}$ (m/z 827, M^+ + K, FAB-MS) showed characteristic absorption in IR and UV spectrum for a flavanone nucleus. Ap-10 on acid hydrolysis furnished an aglycone and sugars. The sugars were identified in the hydrolysate as glucose, rhamnose and galactose by paper chromatographic comparison with authentic sugars. The aglycone, cream coloured granules, m.p. 132-33° was characterized as 3',5,7-trihydroxy-4'-methoxy-flavanone (hesperitin) by a detailed spectral analysis (UV, IR, 'H NMR and MS) and direct comparison with authentic sample. The compound Ap-10 showed a bathochromic shift of 22 nm with $AlCl_3$, but no shift with NaOAc indicated a free-OH at C-5 and absence of a free -OH at C-7 position. The sugars may thus be attached at C-7 position of Ap-10. The 'H and ^{13}C NMR data comparison between Ap-10 and hesperidin (X) revealed that hesperidin exhibits only two anomeric protons [$\boldsymbol{\delta}$ 4.32 (1H, d. J=3Hz) and $\boldsymbol{\delta}$ 4.85 (1H, d, J=3Hz)] and two anomeric carbons [$\boldsymbol{\delta}$ 99.70, 103.60] whereas the compound Ap-10 exhibited three anomeric protons [$\boldsymbol{\delta}$ 5.20 (2H, br.s) and $\boldsymbol{\delta}$ 5.45 (1H, m)] and three anomeric carbons ($\boldsymbol{\delta}$ 99.5, 100.6 and 92.6]. Ap-10 further showed extra signals for a galactose unit compared to hesperidin in its 'H &^{13}C NMR and all other signals of Ap-10 were identical to hesperidin. FAB-MS also favoured the presence of one moleeach of glucose, rhamnose and galactose as exhibited by a molecular ion peak at m/z 827 (M^++K). Permethylation and hydrolysis of permethylate of Ap-10 furnished 3,4-di-O-methylglucose, 2,3,4-tri-O-methylrhamnose and 2,3,4,6-tetra-O-methylgalactose. Ap-10 is thus characterized hesperitin -7-O-D-galactopyranosyl (1→2)-as [rhahmopyramosyl (1→6)]- α-D-glucopyranoside. This is a new flavanone glycoside not reported in literature. It is designated as alhagidin.

RESULT AND DISCUSSION

Chromatographic resolution of the methanol extract whole plant of *Alhagi pseudalhagi* furnished compounds Ap-1, Ap-2, Ap-3, Ap-4, Ap-5, Ap-6, Ap-7, Ap-8, Ap-9 and Ap-10, which were characterized respectively as protopin, apocavidin, demethylcorydalmin, β-sitosterol, sitosterolglucoside, apigenin, naringenin, naringenin-5-methyl ether-4'-O-D-glucoside, hesperidin, hesperitin-7-O-galactopyranosyl(1→2)-[rhamnopyranosyl (1-6)]- a-O-glucopyranoside by a detailed spectral analysis i.e. IR, UV, ^{1}HNMR, mass spectrum and hydrolysis experiments wherever needed and direct comparison with authentic samples (mixed melting points, co-TLC and superimposable IR). All the above compounds are the first report from this plant except β-sitosterol.

ACKNOWLEDGEMENTS

The author is highly grateful to Professor J.P.N. Chansouria, Center of Experimental Medicine and Surgery, Professor V.B. Pandey, Professor V.P. Singh, Department of Medicinal Chemistry, Institute of Medical Sciences, BHU, for their valuable suggestions.

REFERENCES

Kirtikar, K.R. and Basu, B.D. (1948)."Indian Medicinal Plants", Vol.I, p.742-744, Second edition, "The Wealth of India", Raw Materials, Vol. I. p. 51 (1948) Publication and Information Directorate, CSIR, New Delhi.

Ghosal, S. and Srivastava, R.S. (1973).(Inst. Technol. Banaras Hindu University,Varanasi, India).*J. Pharm. Sci.*, 62(9), 1555-6 (Eng.).

Svistunova, S.V.,Khalmotov, Kh.Kh,Khazanovich, R.L. (1972). (USSR). Mater. Yubileinol Resp. Nauchn. Konf. Farm; Posuyashch. 50 Letiyu Obraz. SSSR Sep 1972 (Pub. 1972), 54-5 (Russ).

Burasheva, G. Sh, Mukhamed Yarova, M.M. and Chumbalov, T.K. (1975). (Kaz.Gos. Univ. im. Kirova, Alma Ata, USSR) Khim. Prir. Soedin, 11(2), 254-5 (Russ).

Ghosal, S., Srivastava, R.S., Bhattacharya, S.K. and Debnath, P.K. (1974). (Dep. Pharm. Pharmacol., Banaras Hindu Univ. Varanasi, India) *Planta Med*. (1974, 26(4), 318-26 (Eng).

Burosheva, G. Sh, Mukhamed Yarova, M.M. and Chumbalov, T.K. (1977). (Kaz.Gos. Univ. in. Kirova, Alma-Ata, USSR). Khim. Prir. Soedin, (2)280-1 (Russ).

Yeshodha, K., Dhar, S.C. and Santappa, M. (1977). (Cent. Leather Res. Inst. Madras, India). *Ital J Biochem*., 26(3), 169-80 (Eng).

Behari Mukat and Gupta, S.C. (1980). (Chem. Lab., Shri Varshneya College Aligarh, India). Acta-Cienc. Indica (Ser.). Chem, 6(4), 207-8 (Eng).

Istambekov, Sh. Yu. Mirzakhidov, Kh. A., Karimolzhanov, A.K. and Ishbaev, A.L. (1982). (Inst. Bioorga. Khim. Tashkent, USSR) Khim. Prir. Soedin., (5), 653 (Russ).

Khaitbaev, Kh. Kh., Islambekov, Sn. Yu, Kurbanova, M.M. and Yusupova. Sn (1987). (Inst. Bioorg. Khim Taskkent. USSR). Khim. Farm Zn. 21(11), 1352-4 (Russ).

Viramani, O.P., Popli, S.P., Mishra, L.N., Gupta, M.M., Srivastava, G.N., Abraham, Z. and Singh, A.K. (1992). Dictionary of Indian Medicinal Plants. pp. 23, 1992. Central Institute of Medicinal and Aromatic Plant, Lucknow (India).

Glossary of Indian Medicinal Plant with Active Principles, Part 1, 39 (1992). Publications and Information Directorate (CSIR) New Delhi.

Mabry, T.J. Markham, K.R. and Thomas, M.B. (1970). "The systematic Identification of Flavonoids". p. 41, 46, 48, 51, 55, 81, 90, 294, Springer-Verlag, New York.

The Flavonoids, Advances in Research, Edited by Harborne, J.B., Mabry, T.J. Published by Chapmann and Hall, London, New York, pp. 19.

Geisman, T.A. (1962). The chemistry of Flavonoid compounds. Pargamon Press, Oxford, London, New York, Paris, 666(1962).

Corresponding author: Dr. Bineeta Yadav, Department of Chemistry, D.A.V. Degree College, Lucknow, U.P., India
Email: yadav_bineeta@yahoo.com