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CHEMICAL CONSTITUENTS OF *FRAXINUS SYRIACA*

K. A. Eshbakova* and Kh. Sh. Kamoldinov

S.Yu.Yunusov Institute of the Chemistry of Plant Substances, Academy of Sciences, 100170, Tashkent, Republic of Uzbekistan.

ABSTRACT

The chemical constituents of the terpenoids and phenolic compounds of *Fraxinus syriaca* (family Oleaceae) aerial parts, grown in Uzbekistan was investigated and by colon chromatographic methods were isolated six known compounds. Their structures have been established on the basis of physicochemical and spectral parameters (UV, IR and PMR) and were identified with esculetin, fraxinol, tyrosol, salidroside, 7-ketologanin, esculin. Their antibacterial activity has been studied. Compounds - tyrosol**,** salidroside and 7-ketologanin were isolated from *F. syriaca* for the first time.

Key Words:- *Fraxinus syriaca*, esculetin, fraxinol, tyrosol, salidroside, 7-ketologanin, esculin,UV, IR, NMR-spectrum.

INTRODUCTION

Secondary metabolites are unique compounds, are synthesized in virtually all plant cells that exhibit high biological activity and properties by finding increasingly wide application in pharmacology and medicine. The most important branch of modern physiology and biochemistry is the study of the biochemical aspects of secondary metabolites. A wide range of biological activities and low toxicity makes them a number of promising compounds in this regard. Therefore, the search of plants containing secondary metabolites, methods of their isolation, establishing their chemical structure and biological activity study based on the chemical structure in order to create effective new medicines is an important and urgent problem of modern bioorganic chemistry.

Perennial plants of the genus *Fraxinus* L. (family Oleaceae) are widely distributed in the Flora of Central Asia and are rich sources of coumarins and phenol compounds. More than 15 species grow in Uzbekistan (Flora of the USSR, 1952). The aerial part of the genus *Fraxinus* used in traditional medicine as a relaxant, for cardiovascular diseases, infusion, decoction, powder - binder antifebrile, tonic, wound healing, with metrorrhagia, diarrhea, ascites, anthelmintic, laxative, protistotsidnuyu, rheumatism, arthritis, liver disease, jaundice, kidney disease, nervous disorders (Stoyanov 1949 & 1972; Yordanov *et al*., 1976; Dragendorf, 1898; Garnier *et al*., 1961; Chopra *et al*., 1956; Naimie *et al*., 1964). Extract *F.excelsior* in the experiment exhibits antibacterial activity against Mycobacterium tuberculosis (Nicrell, 1959). *F.mandshurica* and *F.rhynchophylla* in Chinese medicine used as an amoebic dysentery (Shreter, 1964), *F.ornus* whooping cough, diabetes (Stoyanov, 1949; Kit CM and Orlik GG, 1960), *F.sogdiana* in Central Asia - in infertility, increase potency (mixed with honey) (Sahobiddinov SS, 1948).

Fraxinus syriaca Boiss large tree with thick brown-gray cylindrical branches, with the usual light, small lenticels, a height of 10 to 15 meters, grows floodplain forests and mountains of Central Asia. Branch the leaves may be a source of esculin main component of the drug "eskuvit" used in scientific medicine in various bleeding, hemorrhoids, varicose veins and fraksinol. They have antispasmodic properties. The leaves in the experiment show bacterial, and protistotsidnuyu phytoncidic activity (Melkumyan UC, 1963). Early the coumarins have been isolated from *F. syriaca* (Bandukova

Corresponding Author

KA Eshbakova
Email:- e_komila@yahoo.com

VA and Sergeeva NB, 1977). Our objectives and purpose of the present study and isolated of the chemical components of the aerial part of plants *F. syriaca*, and to identify biologically active.

MATERIALS AND METHODS

General Comments. UV spectra were measured on a Lambda-16 spectrophotometer (Perkin–Elmer). Melting points were determined on a Boetius heating stage. IR spectra were recorded in KBr on a Perkin–Elmer Model 2000 Fourierspectrometer. PMR and ^{13}C NMR spectra were recorded in DMSO-d6 on a Unity-400plus spectrometer (Varian) at operating frequency 400 MHz using HMDS as an internal standard for PMR spectra and the DMSO-d6 resonance (39.5 ppm vs. TMS) for ^{13}C NMR spectra. TLC used Silufol UV 254 plates with detection by iodine vapor, ammonia vapor, UV emission at 254 and 365 nm, and vanillin solution (1%) in conc. H_2SO_4. PC was carried out on Filtrak No. 11 paper using *n*-BuOH: HOAc: H_2O (4:1:5, 1) and *n*-BuOH: Py: H_2O (6:4:3, 2). Free monosaccharides were detected in PC by spraying with anilinium phthalate.

Extraction and Isolation of Chemical components from the Aerial Part of F. *syriaca*

We have investigated the aril parts of *F. syriaca* collected in the Surkhandarya region of Uzbekistan. Air-dried ground plant material (1000 g) was extracted at room temperature by EtOH (70%, 6 x 5 L). The combined extracts were vacuum distilled. The extract was condensed residue (120 g) and diluted with H_2O (1:1). The diluted solution was worked up successively with hydrocarbons, $CHCl_3$, EtOAc, and BuOH. Evaporation of the solvents afforded $CHCl_3$ (12 g), EtOAc (20 g), and BuOH (27 g) fractions. TLC studies of the resulting fractions found that the $CHCl_3$ fraction contained mainly coumarins; EtOAc and BuOH, terpenoids and phenol compounds.

The BuOH fraction (27 g) was chromatographed on a column (130 x 2.5 cm) of silica gel with a gradient of solvents chloroform and chloroform - methanol. Eluting the column with a mixture of chloroform -methanol (50:1) isolated 0.22 g esculetin (1), and eluted with chloroform - methanol (45:1), 0.35 g fraxinol (2). On further elution of the column with a mixture of chloroform -methanol (25:1) were 0.20 g tyrosol (3), eluting with chloroform – methanol (9:1), 0.15 g salidroside identified (4). Further elution of the column with chloroform – methanol (6:1) gave pure 7-ketologanin 0.27 g (5). Eluting the column with chloroform - methanol (4:1) isolated 0.33 g esculin (6).

RESULTS AND DISCUSSION

The structures of isolated compounds were established on the basis of their physical and chemical properties, IR, UV, PMR, ^{13}C NMR and DEPT spectral data and also TLC analysis. As a result the compounds were identified with esculetin (**1**) (S. E Dzumyrko, 1976), fraxinol (**2**) (M. V. Artem'eva *et al*., 1973), 2-(4-hydroxyphenyl) ethanol (tyrosol) **(3)**, 2-(4-hydroxyphenyl) ethyl-β-D-glucopyranoside (salidroside) **(4)**, 7-ketologanin (**5**) (Kh. Sh. Kamoldinov *et al*., 2011), esculin (**6**) (S. E Dzumyrko, 1976).

Esculetin (**1**) $C_9H_6O_4$, white crystal, mp 268-270°C, UV spectrum (MeOH, λ_{max}, nm): 232, 260, 301, 363. IR spectrum (KBr, ν_{max}, cm^{-1}): 3341-3200 (OH-group), 1717 (C=O), 1672, 1624, 1567 (C=C). PMR spectrum (400 MHz, CD_3OD, δ, ppm, J/Hz): 6.34 (1H, d, J = 9.5, H-3), 7.77 (1H, d, J = 9.5, H-4), 6.77 (1H, s, H-8), 7.02 (1H, s, H-5), 3.45 (2H, br.s, 2-OH). ^{13}C NMR spectrum (100 MHz, CD_3OD, δ, ppm): 161.2 (C-2), 112.1 (C-3), 144.6 (C-4), 112.7 (C-5), 143.2 (C-6), 150.7 (C-7), 102.7 (C-8), 149.1 (C-9), 111.1 (C-10).

Fraxinol (**2**) $C_{10}H_{10}O_5$, white powder, mp 171-172°C. UV spectrum (MeOH, λ_{max}, nm): 234, 317, 347. IR spectrum (KBr, ν_{max}, cm^{-1}): 3411-3200 (OH-group), 1724 (C=O), 1672, 1622, 1563 (C=C). PMR spectrum (400 MHz, CD_3OD, δ, ppm, J/Hz): 6.36 (1H, d, J = 9.6, H-3), 7.78 (1H, d, J = 9.6, H-4), 6.75 (1H, s, H-8), 3.72 (3H, s, OCH_3), 3.77 (3H, s, OCH_3).

Tyrosol (3), $C_8H_{10}O_2$, white crystal, mp 94–95°C. UV spectrum (MeOH, λ_{max}, nm): 204.28, 222.89, 278.01. IR spectrum (KBr, ν_{max}, cm^{-1}): 3390, 3139, 2879, 1883, 1559, 1513, 1451, 1361, 1231, 1052, 817, 555. PMR spectrum (400 MHz, CD_3OD, δ, ppm, J/Hz): 2.65 (2H, t, J = 4.9, H-7), 3.61 and 3.98 (2H, t, J = 14.05, H-8), 6.64 (2H, d, J = 9.0, H-3,5), 6.97 (2H, d, J = 9.0, H-2,6). ^{13}C NMR spectrum (100 MHz, CD_3OD, δ, ppm): 146.35 (C-1), 130.86 (C-2), 116.10 (C-3), 156.70 (C-4), 116.10 (C-5), 130.86 (C-6), 39.37 (C-7), 64.57 (C-8).

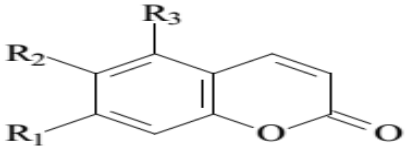
Salidroside (4), $C_{14}H_{20}O_7$, white powderl, mp 165°C. UV spectrum (MeOH, λ_{max}, nm): 223.40, 277.84. IR spectrum (KBr, ν_{max}, cm–1): 3274, 2933, 1616, 1518, 1444, 1377, 1241, 1131, 1073, 1027, 900, 823, 775, 630, 503. PMR spectrum (400 MHz, CD_3OD, 0 = HMDS, δ, ppm, J/Hz): 2.78 (2H, t, J = 7.5, H-7), 3.62 (1H, dd, J = 15.0, 7.4, H-8α), 3.98 (1H, dd, J = 15.0, 7.4, H-8β), 6.64 (2H, d, J = 9.0, H-3,5), 7.00 (2H, d, J = 9.0, H-2,6), 3.12 (1H, d, J = 7.9, H-2'), 3.20–3.35 (3H, m, H-3',4',5'), 3.80 (2H, dd, J = 12.0, 2.0, H-6'), 4.22 (1H, d, J = 7.9, H-1'). ^{13}C NMR spectrum (100 MHz, CD_3OD, δ, CD_3OD = 49.0 ppm):

130.90 (C-1), 130.68 (C-2), 116.10 (C-3), 156.70 (C-4), 116.10 (C-5), 130.68 (C-6), 36.30 (C-7), 71.54 (C-8), 104.30 (C-1'), 72.10 (C-2'), 77.84 (C-3'), 71.54 (C-4'), 78.00 (C-5'), 62.67 (C-6').

7-Ketologanin (5), $C_{17}H_{24}O_{10}$, white powder, mp 195°C. UV spectrum (MeOH, λ_{max}, nm): 231.17. IR spectrum (KBr, ν_{max}, cm^{-1}): 3374, 2921, 1749, 1683, 1644, 1446, 1299, 1075, 889, 845.PMR spectrum (400 MHz, DMSO-d_6, 0 = HMDS, δ, ppm, J/Hz): 1.01 (3H, d, J = 7.0, H-10), 1.89 (1H, m, H-8), 2.26 (1H, ddd, J = 10.5, 7.9, 2.9, H-9), 2.36 (1H, br.d, J = 18.9, H-6α),2.56 (1H, dd, J = 18.9, 8.4, H-6β), 3.06 (1H, m, H-5), 3.58 (3H, s, OCH_3), 5.51 (1H, d, J = 2.9, H-1), 7.39 (1H, d, J = 1.4, H-3), 2.92 (1H, t, J = 8.0, H-2'), 2.98 (1H, t, J = 8.9, H-4'), 3.08 (2H, m, H-3',5'), 3.39 (1H, dd, J = 11.9, 6.2, H-6β), 3.62 (1H, dd, J = 11.9, 1.6, H-6α), 4.44 (1H, d, J = 7.8, H-1'). ^{13}C NMR spectrum (100 MHz, δ, DMSO-d_6 = 39.5 ppm): 93.24 (C-1), 151.66 (C-3), 109.13 (C-4), 26.47 (C-5), 42.04 (C-6), 217.78 (C-7), 42.74 (C-8), 44.25 (C-9), 13.14 (C-10), 166.56 (C-11), 98.65 (C-1'), 73.07 (C-2'), 76.63 (C-3'), 70.04 (C-4'), 77.35 (C-5'), 61.13 (C-6'), 51.07 (OCH_3).

Esculin $C_{16}H_{18}O_9$ (**6**), mp 204–205°C. UV spectrum (MeOH, λ_{max}, nm): 231, 266, 300, 365. IR spectrum (KBr, ν_{max}, cm^{-1}): 3400-3200 (OH-group), 1725 (C=O), 1671, 1622, 1569 (C=C). **C**ompound **6** (20 mg) was hydrolyzed in aqueous methanolic HCl (15 mL, 2%) for 5 h on a boiling-water bath. The resulting precipitate of the aglycon was filtered off and recrystallized from $CHCl_3$ to afford esculetin $C_9H_6O_4$ (**1**), mp 268-270°C (6 mg). The carbohydrate part of the hydrolysate was neutralized with $BaCO_3$ and evaporated and with PC identified D-glucose.

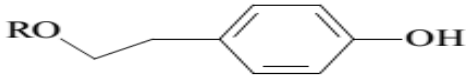
Tyrosol**,** salidroside and 7-ketologanin were isolated from *F. syriaca* for the first time. In the experiments the extract of *F. syriaca* showed high antibacterial activity.



1. R_1=OCH_3, R_2=OH, R_3=OCH_3

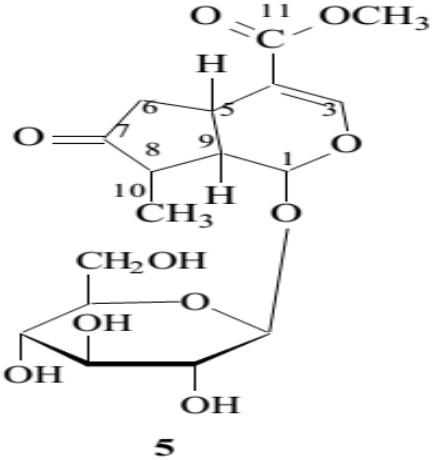
2. R_1=OH, R_2=OH, R_3=H

6. R_1=OH, R_2=O-β-D-Glcp, R_3=H



3. R=H

4. R= β-D-Glcp



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REFERENCES

Artem'eva MV, GK Nikonov and MO Karryev. Coumarins of *Fraxinus mandschunica* and *F.potamophila*, *Chemistry of Natural Compounds*, 3, 1973, 465-467.

Bandukova VA, Sergeeva NB. Sostoyanie chimicheskogo izucheniya rasteniya poryadka *Celastrales* (Rastitenie resursi) [in Russian], 1977, 13, 560-569.

Chopra RN, Nayar SL. Chopra IC. Glossary of Indian medicinal plants. New Delhi, 1956, 330.

Dragendorf G. Die Heilpflanzen der verschiedenen Volker und Zeiten, Stutgart, 1898, 884.

Dzumyrko SE. Coumarins of *Koelpina linearis*, *Chemistry of Natural Compounds*, 3, 1976, 477.

Flora of the USSR [in Russian]. Vol. 18, Izd. Akad. Nauk SSSR, Leningrad, Moscow, 1952, 485-502

Garnier GL, Bezanger-Beauquesne, G. Debraux, Ressources medicinales de la flore francaise: T. 1-2, Paris, 1961, 1511.

Kamoldinov Kh Sh, KA Eshbakova, Kh M Bobakulov and ND Abdullaev. Components of *Fraxinus raibocarpa, Chemistry of Natural Compounds*, 47(3), 2011, 448-449.

Kit CM, Orlik GG, O Saharosnijayushem Deystvii Nekotorih Lekarstvennih Rasteniy. *Rachebnoe Delo [in Russian]*, 1960, 6, 617-622

Melkumyan UC. Antimikrobnie svoystva nekotorih predstaviteley flore Armenii, Avtoref.dis, PhD. Erevan, 1963, 25.

Naimie H, Attempts to isolate and purify substances inhibitory to Bacillus subtilis from tree bark// *Angew. Bot*, 1964, 38, 1-43, *Chem Abstrs*, 1966, 64, 20-191

Nicrell LG, Antimicrobial activity of vascular plants, *Econ Bot*, 1959, 13(4), 281-318.

Shreter AI, Poisk novih lekarstvennih rasteniy iz flori sovetskogo Dalnego Vostoka/Izuchenie I ispolzovanie lekarstvennih rastitelnih resursov SSSR [in Russian], 1964, 191-194.

Stoyanov N. Zashite lekarstveni rasteniya: B 2 [in Russian], 2-e izd. *Sophiya*, 1972, 1, 344.

Stoyanov N. Zashite lechebni I blagouhanni rasteniya [in Russian], *Sophiya*, 1949, 413.

Sahobiddinov SS. Dikorastuyushie lekarstvennie rastenya Sredney Azii [in Russian],Tashkent, 1948, 216

Yordanov DP, Nikolov A. Boychinov, *Phytoterapiya* [in Russian]. *Sophiya*, 1976, 349.