

NONPOLAR COMPOUNDS FROM *LUFFA AEGYPTIACA* FRUIT

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Abstract. *The unsaponifiable and saponifiable constituents from the alcoholic extract of Luffa aegyptiaca fruit (Cucurbitaceae) were investigated by GC-MS. The results showed the presence of hydrocarbons viz., n-tricosane (0.41 %), n-tetracosane (0.83 %), n-hexacosane (2.02 %), n-heptacosane (4.88 %), n-octacosane (2.57 %) and fatty acids viz., nanodecane-6-ol (17.65 %), eicosane-6-ol (2.54 %), dieicosane-6-ol (7.85 %), tetraeicosane-6-ol (1.75 %).*

Key words: *Luffa aegyptiaca*, Cucurbitaceae, hydrocarbons, fatty acids.

INTRODUCTION

Luffa aegyptiaca (Cucurbitaceae) is a small herb bearing yellow flowers crowded near the top of the raceme. Leaves are orbicular, reniform and often broader than long. Fruits are smooth, cylindrical and usually 20-30 cm long. Seeds are black or gray and are compressed. Fruits are useful in leprosy, spleen diseases, piles, fever, haematuria and bronchitis [1, 2].

The purpose of present paper is to do qualitative and quantitative identification of nonpolar compounds from *L. aegyptiaca* fruits.

EXPERIMENT

Plant material. Fruits of *Luffa aegyptiaca* were collected from Ahmednagar district of Maharashtra in December 2006 and authenticated from Department of Botany, P.V.P. College, Loni.

Extraction. The extraction with ethanol was carried out by continuous hot extraction method using Soxhlet extractor till all constituents were removed. The end of completion of extraction was indicated by no color with iodine in iodine chamber. Extract was concentrated by vacuum distillation and made hydroalcoholic by adding water. This hydroalcoholic portion was shaken with petroleum ether (60^o-80^o) to produce petroleum ether soluble fraction. It gave 4.75 g of the residue.

Saponification and isolation. Petroleum ether fraction (4.75 g) and 12 % ethanolic solution of NaOH (45 mL) were refluxed for 2 hours on the steam bath. Water (50 mL) was added to the reaction mixture and cooled to room temperature. The part of the extract, which failed to react, was separated by extraction with solvent ether which gave unsaponifiable non-polar compounds viz. hydrocarbons. The water-ethanolic solution of the soap was acidified with HCL (1:1) to pH 5-6 and extracted four times (50 mL) with solvent ether. The combined organic phases were washed with a 10 % sodium chloride solution till pH 7 was achieved. The evaporation of the solvent under reduced pressure afforded 0.16 % of fatty acids, which was dried in a vacuum desiccator over anhydrous CaCl₂ [3, 4].

Esterification of fatty acids. Fatty acids (0.18 g) and 1 % ethanol solution of H₂SO₄ were refluxed for 1.5 hours on the steam bath. The reaction mixture was evaporated under reduced pressure. Water (50 mL) was added to the residue and reaction mixture was extracted three times with petroleum ether (30 mL). The combined petroleum ether extract was washed two times with 2 % NaHCO₃ solution and then with water till pH 7 was achieved. The organic phase was dried over anhydrous sodium sulphate and concentrated to 5 mL under reduced pressure.

GC/MS Analysis. GC/MS analysis [5] was conducted using a Shimadzu QP 5050 equipped with reference libraries using SE-52 (Mega, Legnano, Italy) cross-linked fused-silica capillary column coated with 5 % phenyl-polymethylsiloxane (25 m X 0.25 mm i.d. X 0.25 μm film thickness); column temperature, 60^o C (8 min) to 180^o C at 3^oC/min, to 230^oC at 20^oC/min. Injector temperature 250^oC; injection mode, split; split ratio 1:40, volume injected, 0.2 μL of solution. Helium was used as the carrier, using 122.2 kPa (51.6 cm/sec); interface temperature 250^oC; acquisition mass range 40-400.

Identification and quantification. The compounds were identified by comparison of their Linear Retention Indices, determined in relation to a homologous series of n-alkanes, with those from pure standard reported in literature. Comparison of fragmentation patterns in the mass spectra with those stored in databases [6]. The comparison and quantification of the components were performed on the basis of their GC peak areas.

RESULTS AND DISCUSSION

The extraction of the dried plant material yields 4.75 g of the petroleum ether extract which was saponified to get unsaponifiable hydrocarbons. Saponified part of the extract was subjected to esterification to get fatty acids. The identification of hydrocarbons and fatty acids by GC-MS gave the results shown in Table 1 and Table 2.

Table 1. Hydrocarbons from *Luffa aegyptiaca* fruits.

Compound identified ^a	Rt (min)	% composition	Retention Index ^b
n-Tricosane	15.42	0.41	1577.00
n-Tetracosane	16.00	0.83	1636.32
n-Hexacosane	19.26	2.02	1969.72
n-Heptacosane	24.91	4.88	2547.55

^a Constituents are reported accordingly to their elution order on SE-52

^b Relative to C₉ – C₁₇ n-alkanes

Table 2. Fatty acids from *Luffa aegyptiaca* fruits.

Compound identified ^a	Rt (min)	% composition	Retention Index ^b
Nanodecane-6-ol	17.93	17.65	1833.70
Eicosane-6-ol	19.32	2.54	1975.86
Dieicosane-6-ol	21.26	7.85	2174.26
Tetraeicosane-6-ol	25.58	1.75	2616.07
Total identified		29.79	

^a Constituents are reported accordingly to their elution order on SE-52

^b Relative to C₉ – C₁₇ n-alkanes

n-Tricosane. 43 (59.99), 57 (100), 71 (77.77), 85 (53.33), 99 (15.55), 113 (6.67), 324 (2.24).

n-Tetracosane. 43 (100), 57 (89.80), 71 (69.39), 85 (26.53), 99 (14.29), 113 (2.041), 338 (1.019)

n-Hexacosane. 43 (51.072), 57 (100), 71 (85.12), 85 (61.71), 99 (19.15), 113 (8.51), 342 (2.41).

n-Heptacosane. . 43 (53.84), 57 (100), 71 (82.05), 85 (64.10), 99 (17.95), 113 (10.26), 127 (7.69), 141 (5.51), 380 (3.27).

n-Octacosane. 43 (44.19), 57 (100), 71 (81.41), 85 (62.80), 99 (20.93), 113 (13.96), 127 (6.98), 141 (4.65), 155 (2.46), 169 (2.33), 394 (1.81).

Nanodecane-6-ol. 88 (100), 101 (72.73), 284 (3.6).

Eicosane-6-ol. 55 (18.18), 71 (9.09), 88 (100), 101 (54.55), 298 (2.8).

Dieicosan-6-ol. 43 (20.0), 88 (100), 101 (80.0), 157 (30.0), 326 (4.8).

Tetraeicosane-6-ol. 43 (33.33), 57 (37.5), 69 (16.67), 88 (100), 101 (75.0), 157 (25.0), 354 (3.6).

CONCLUSIONS

Hydrocarbons identified from fruits of *L. aegyptiaca* are n-tricosane, n-tetracosane, n-hexacosane, n-heptacosane and n-octacosane and fatty acids identified are nanodecane-6-ol, eicosane-6-ol, dieicosane-6-ol and tetraeicosane-6-ol.

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**NEPOLARNI KONSTITUENTI PLODOVA
BILJNE VRSTE *LUFFA AEGYPTICA***

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*Neosapunjivi i osapunjivi konstituenti iz alkoholnog ekstrakta plodova biljne vrste *Luffa aegyptica* (Cucurbitaceae) su analizirani pomocu GH-MS. Identifikovani su ugljovodonicni dugog lanca, tj. n-trikozan (0,41%), n-tetrakozan (0,83%), n-heksakozan (2,02%), n-heptakozan (4,88%) i n-oktakozan (2,57%), kao i 6-alkanoli, masni alkoholi dugog niza, konkretno: 6-nonadekanol (17,65%), 6-ikozanol (2,54 %), 6-dokozanol (7,85%), 6-tetrakozanol (1,75%).*