Characteristics and Compositions of *Carissa spinarum*, *Leucaena leucocephala* and *Physalis minima* Seeds and Oils

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ABSTRACT

The seeds and extracted oils of *Carissa spinarum* (Apocynaceae), (I), *Leucaena leucocephala* (Leguminosae) (II) and *Physalis minima* (Solanaceae) (III) were analyzed for characteristics and compositions. The seeds of I, II and III contained 22.4, 6.4 and 40.0% oil and 10.1, 27.6 and 17.9% protein, respectively. The oils of I, II and III had, respectively, iodine values 70.1, 113.5 and 122.5; saponification values 186, 188 and 189; unsaponifiable matter 5.2, 2.5 and 0.8%, and the following fatty acid compositions (area %): palmitic 12.6, 14.2, 10.5; stearic 7.6, 6.1, 8.6; oleic 72.7, 20.1, 17.3; linoleic 5.2, 53.8, 61.4; linolenic 0.9, 1.8, 0.0, and arachidic 1.0, 2.3, 0.0. II contained 1.7% lignoceric acid. III contained small amounts of hexadecenoic (0.1%), epoxy (0.6%) and hydroxy (1.5%) fatty acids.

INTRODUCTION

Carissa spinarum, Linn. (*Apocynaceae*) is a small spinous, evergreen shrub growing throughout India in dry regions. The blue grape-like fruits ripen during November and December (1). *Leucaena leucocephala,* Benth. (*Leguminosae*) popularly known as "Kubabul" or "Subabul", is an important crop encouraged under the social forestry schemes in drought-prone areas and semiarid tracts in India as it provides in short time useful timber and leaves (2). The berry-like fruits of *Physalis minima,* Linn. (Solanaceae), a climber, have found varied applications in Indian cookery (3). Characteristics and compositions of seeds of these three species and oils extracted therefrom are reported here for the first time.

EXPERIMENTAL

C. spinarum and *P. minima* fruits were picked from trees growing in the vicinity of Anantapur town. The seeds were removed and dried. The seeds of *L. leucocephala* were procured fresh from the local social forestry agency. The seeds were crushed and extracted with n-hexane in a Soxhlet apparatus.

The physicochemical characteristics of seeds and oils were determined by AOCS Methods (4). The oils were converted to methyl esters by refluxing with methanol containing 1.0% sodium methoxide, according to the procedure described by Schneider et al. (5). The oils, as well as the methyl esters, were qualitatively examined for the presence of hydroxy, epoxy and cyclopropene fatty acids by the sulfuric acid turbidity test (6), Fioriti's picric acid test (7) and the Halphen test (4), respectively. The oils and methyl esters were examined for ultraviolet (UV) absorption in CCl_4 on a Beckman 26 UV-Visible spectrophotometer and for infrared (IR) absorption as a liquid film on a Perkin-Elmer 221 spectrometer.

Thin-layer chromatography (TLC) of methyl esters was

TABLE I

Physico-Chemical Characteristics and Composition of Seeds and Oils from *Carissa spinarum, Leucaena leucocephala* and *Physalis minima*

	Carissa spinarum	*Leucaena leucocephala*	*Physalis minima*
Seed			
Length (mm)[a]	3.4	8.2	3.5
Breadth (mm)[a]	3.1	5.7	2.6
Thickness (mm)[a]	1.8	1.7	1.1
wt. of 100 seeds (g)	1.2	6.5	1.0
Moisture (%)	9.8	6.0	5.6
Oil (%)[b]	22.4	6.4	40.0
Protein (%)[b]	10.1	27.6	17.9
Ash (%)[b]	2.2	3.8	2.1
Crude fiber (%)[b]	21.6	12.3	24.2
Hull/kernel ratio	—	50:50	30:70
Oil			
Specific gravity, 30/30 C	0.9078	0.9135	0.9176
Refractive index at 40 C	1.4640	1.4662	1.4679
Iodine vlue (Wijs)	70.1	113.5	122.5
Acid value	7.0	2.6	0.7
Saponification value	186	188	189
Unsaponifiable matter (%)	5.2	2.5	0.8
Fatty acid (Area %)[c]			
Palmitic	12.6	14.2	10.5
Stearic	7.6	6.1	8.6
Oleic	72.7	20.1	17.3
Linoleic	5.2	53.8	61.4
Linolenic	0.9	1.8	0.0
Arachidic	1.0	2.3	ND[d]
Lignoceric	ND	1.7	ND

[a]Average of 10 seeds.
[b]Dry basis.
[c]*P. minima* also contained hexadecenoic (0.1%), epoxy (0.6%) and hydroxy (1.5%) fatty acids.
[d]Not detected.

carried out on Silica gel G using n-hexane-diethyl ether (90:10, v/v). Gas liquid chromatography (GLC) of the methyl esters of the oils was carried out using a Hewlett-Packard 5840A unit fitted with a hydrogen flame detector and data processor. A glass column (1.8 m × 6 mm) packed with 10% DEGS on Chromosorb W HP 80-100 mesh at 190 C and a stainless steel column (1.8 m × 3 mm) packed with 5% SE-30 on Chromosorb W HP DMCS 80-100 mesh at 200 C were used. The injection and detector temperatures were maintained at 250 C and 300 C respectively. Flow rates of the carrier gas (nitrogen) were 40 and 30 ml, respectively. Standard fatty acid methyl esters were used to identify the peaks. No correction factors were applied. Area percentage was recorded.

RESULTS AND DISCUSSION

The seeds of *C. spinarum* resemble coriander seeds. The seeds of *L. leucocephala* have hard black hulls and yellow kernels. The seeds of *P. minima* resemble muskmelon seeds. The seed oils were yellow. The characteristics and compositions of the three seeds and oils are given in Table I. The oil content was appreciable in *C. spinaram* and *P. minima* seeds and low in *L. leucocephala* seeds, while the reverse was true for protein content.

The iodine values of the oils indicate that the seed oils of *L. leucocephala* and *P. minima* are semidrying type. The oils as well as methyl esters of *P. minima* responded positively to the qualitative tests for hydroxy and epoxy fatty acids (6,7) while the other two oils did not. All the oils gave a negative response for the Halphen test (4), indicating the absence of cyclopropene fatty acids. IR spectra showed a bond at 3600 cm^{-1} for *P. minima* oil and esters. Neither trans nor conjugated unsaturation was seen in the IR and UV spectra of any of the oils or esters. TLC of methyl esters of *P. minima* showed the presence of hydroxy and epoxy fatty acids. GLC analyses for fatty acid composition on the SE-30 column showed the presence of epoxy (0.6%) and hydroxy (1.5%) fatty acids in *P. minima* seed oil. *C. spinarum* and *L. leucocephala* seed oil methyl esters showed no unusual components. The seed oils of *L. leucocephala* and *P. minima* are rich in linoleic acid (53.8% and 61.5% respectively), whereas the *C. spinarum* seed oil is rich in oleic acid (72.7%). Significant quantities of arachidic and lignoceric acids were found in the seed oil of *L. leucocephala.*

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