

## LIPID FRACTIONS AND FATTY ACID COMPOSITION OF *TRIANTHEMA PORTULACASTRUM* LINN

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*Trianthema portulacastrum* seed oil (12.5 %) has been examined for its physico-chemical characteristics and fatty acid composition. Thin layer chromatography of the oil into lipid classes resulted into polar lipids (4.8%) and neutral lipids (95.2 %). Fractionation of the neutral lipids provided hydrocarbons (0.3 %), wax esters (0.5 %), sterol esters (4.0 %), triglycerides (84.5%), free fatty acids (1.8 %), diglycerides (2.5 %) and monoglycerides (1.6 %). The fatty acids which ranged from C<sub>8</sub> to C<sub>20</sub> have also been reported.

**Key words:** Fatty acids, *Trianthema portulacastrum*, lipids, seed oil.

### Introduction

*Trianthema portulacastrum* belonging to N.O. Ficoideaceae [1] is commonly known as 'Itsit' in Punjab. The plant is a fast growing wild weed which grows throughout Pakistan and in most tropical countries during the rainy season in crop fields, gardens, river sides and other waste lands. The weed is poisonous because of soluble oxalates present in its leaves and stems and cannot be used as a fodder [2]. Despite extensive work carried out on the different aspects of *T. portulacastrum* [3], the oil from its seeds has not been reported. The present study describes the physico-chemical characteristics and fatty acid composition of the oil as determined by modern techniques.

### Materials and Methods

*T. portulacastrum* weed was collected from the vicinity of PCSIR Laboratories Complex Lahore, during September-October, 1994, dried in the shade and sieved to free it from dust and other plant materials. The seeds were dried, powdered and extracted at room temperature with chloroform/methanol (2:1 v/v) according to the procedure of Folch *et al.* [4]. The extracts were washed with water to remove non lipid contaminants, dried over anhydrous sodium sulphate and filtered. The solvent was removed in a rotatory evaporator at 40°C under reduced pressure. A number of physico-chemical parameters of the oil, thus obtained, were measured according to the standard procedures [5], the parameters being specific gravity, refractive index (Abbe's), acid value, saponification, iodine and peroxide values, given in Table 1.

**Fractionation of the oil into lipid classes** [6,7]. The oil (0.4 g) was separated by thin-layer chromatography (TLC) using five 20x20 cm glass plates coated with 1 mm kieselgel 60 G. The chromatograms were developed in hexane/diethyl ether/acetic acid (80:20:1) (v/v/v) and the resulting bands were observed under UV light by spraying with 2',7'-dichlo-

rofluorescein in methanol. Typical R<sub>f</sub>'s of the lipid classes were hydrocarbons (0.89), wax esters (0.81), sterol esters (0.65), triglycerides (0.54), free fatty acids (0.42), diglycerides (0.3), monoglycerides (0.17) and polar lipids (0.0). Lipid classes were identified by comparison of R<sub>f</sub>'s with those of the standards under identical conditions.

The lipid bands were observed under UV light, after being sprayed with 2',7'-dichlorofluorescein, scrapped off, extracted from silica gel with chloroform and filtered. The content of each lipid class was determined gravimetrically (Table 1).

Fatty acids of the oil were prepared by the standard method of saponification with alcoholic KOH [8]. The removal of unsaponifiable matter was carried out with diethyl ether and quantitative conversion of fatty acids to the methyl esters was achieved using absolute methanol and conc. sul-

TABLE I. PHYSICO-CHEMICAL CHARACTERISTICS OF *TRIANTHEMA PORTULACASTRUM* LINN SEED OIL.

(a)		
Specific gravity at 25°	=	0.942
Refractive index at 25°	=	1.469
Acid value	=	1.04mg KOH per g of oil
Saponification value	=	203.3mg KOH per g of oil
Iodine value	=	110.7
Peroxide value	=	0.78 milli. eq <sup>1</sup> per g of oil
Unsaponifiable matter	=	35g kg
(b)		
Neutral lipids	=	95.2 %
Polar lipids	=	4.8 %
<i>Fractionation of Neutral Lipids</i>		
Hydrocarbons	=	0.3 %
Wax esters	=	0.5 %
Sterol esters	=	4.0 %
Triglycerides	=	84.5 %
Free fatty acids	=	1.8 %
Diglycerides	=	2.5 %
Monoglycerides	=	1.6 %

furic acid. The methyl esters were purified by column chromatography on silica gel by eluting with hexane/diethyl ether (99.5:0.5 v/v). The purity of esters was monitored by TLC and infrared (IR) spectroscopy.

Methyl esters of triglycerides were prepared by using a mixture of boron trifluoride in methanol [9].

*Identification by GC and GC/MS.* Methyl esters were analysed using a Shimadzu GC-14A gas chromatograph equipped with a flame ionization detector and packed glass column (1.6 m x mm i.d.) containing 15% diethylene glycol succinate on Shimalite (AW) (201), mesh size 60-80. Nitrogen was used as a carrier gas with a pressure of 0.3 kg/cm<sup>2</sup>. The column temperature was maintained at 200°C, while the detector and injector temperatures were 300° and 250°C respectively. The fatty acid methyl esters were identified by their retention times and peak enhancement using authentic standards. The percentage composition of each individual component was calculated on the basis of peak area using a Shimadzu C-R4A (chromatopac) data processor (Table 2).

Jeol model JMS-AX505H Mass Spectrometer combined with Hewlett 5890 Packard gas chromatograph was used for GC/MS analysis. Samples were injected on to a column (25 m x 0.22 mm i.d.; phase thickness 0.25 µ) containing 5 % phenyl siloxane and 95 % dimethyl siloxane, coated with BP-5 (bonded phase) and helium as carrier gas, split ratio 1:100, EI positive mode, electron energy 70 eV, ionization current 300 µA, ionization source temperature 250°C, interface temperature 230°C, column temperature programmed at 60°C for 4 min with a 6°C/min. rise to 230°C. Data acquisition and reprocessing were performed by Jeol JMA-DA 5500 system with MS-48TK library search system. The fatty acid components of the total lipids were confirmed by this method (Table 3)

### Results and Discussion

The physico-chemical characteristics of the oil are shown in Table 1. The oil content of *T. Portulacastrum* is found to be 12.5%. It consists primarily of neutral lipids (95.2%)

TABLE 2. FATTY ACID COMPOSITION OF THE SEED OIL AND TRIGLYCERIDES OF *TRIANTHEMA PORTULACASTRUM* LINN.

Fatty acids (%)	Total lipids	Triglycerides
C <sub>8</sub> :0	Trace	Traces
C <sub>10</sub> :0	Traces	Traces
C <sub>14</sub> :0	0.6	0.7
C <sub>16</sub> :0	13.1	15.0
C <sub>18</sub> :0	5.6	6.2
C <sub>18</sub> :1	23.0	23.3
C <sub>18</sub> :2	55.6	52.8
C <sub>18</sub> :3	0.8	0.4
C <sub>20</sub> :0	1.2	1.2

mainly triglycerides, including hydrocarbons, wax-esters, free fatty acids, mono and diglycerides with small amounts of polar lipids (4.8%). The fatty acid composition of total lipids and isolated triglycerides are reported for the first time (Table 2&3). A comparison of fatty acid composition of the triglycerides (84.5%) and total lipids (95.2%) (Table 2) indicates that the total oil consists mainly of unsaturated fatty acids. Although Osman *et al.* [10] have investigated two different

TABLE 3. CHARACTERISTIC MASS FRAGMENTS OF METHYL ESTER OF FATTY ACID.

Fatty acid	Common name	Scan no.	Characteristic M/z (Relative intensity)
C <sub>14</sub> :0	Myristic acid	519	242(18.6), 211(6.3), 199(14.3) 157(7.1), 143(23.1) 129(7.1), 87(61.4), 74(100), 57(18.6) 55(14.6), 43(22.9) 41(15.7)
C <sub>16</sub> :0	Palmitic acid	748	270(58.6), 239(17.9), 227(26.7), 213(5.7), 199(11), 171(12.9), 157(6.2), 143(37.1) 129(16.2), 115(6.7), 101(11.4), 87(100) 74(100), 55(29.5), 43(33.3)
C <sub>18</sub> :2	Linoleic acid	954	294(51), 263(23.8), 222 (11), 221(11), 178(12.6) 164(18.1), 150(22), 123 (29.5), 109 (44.8) 95 (77.1), 81(99), 67(100), 55 (76.2), 41(51.4)
C <sub>18</sub> :1	Oleic acid	258	296(26.2), 264(94.3) 246(7.6), 222(41.7), 180(31.4), 166(16.4) 137(21), 123(29.5), 110(39.5), 97 (67), 83(72.2), 69(83.3), 55(100),41(59.1)
C <sub>18</sub> :0	Stearic acid	974	298(50.5), 267(11.2), 255(20), 241(4.3), 213(6.2) 199(15.7), 185(6.7), 157(5.5) 143(30.5), 129(10.5), 111(4.8), 97(10), 87(71.4), 74(100), 55(23.8),43(26.7)
C <sub>20</sub> :0	Arachidic acid	1176	326(61), 195(8.5), 283(16.8)227 (9.3), 213(2.9),199(9.5), 157 (4.3), 143 (29.1), 129(10.7), 97(10.5), 87(73.3), 74(100), 55(25.7), 43(31)

species (*T. monogyna* and *T. pentandra*), no work has previously been reported on the composition of oil from this species.

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