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FATTY ACID COMPOSITION OF SALT STRESSED *ARACHIS HYPOGAEA* SEEDLINGS

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Key Word Index—*Arachis hypogaea*; Leguminosae; groundnut; seedling; fatty acid composition; salt treatments.

Abstract—Etiolated *Arachis hypogaea* seedlings grown in the presence of sodium chloride and sodium sulphate were analysed for their percent fatty acid composition. A higher proportion of oleic and linoleic acids resulting in a higher unsaturated–saturated fatty acid ratio was noticed in 6–10 day old embryonic axes of the salt treated seedlings.

INTRODUCTION

The fatty acid composition of seeds depends on the variety of seeds and on the conditions of growth [1, 2] and changes during their development [3, 4]. Several environmental factors also alter the level and composition of plant cell lipids. Several plant species adapt to extreme environmental conditions and lipid metabolism may become an important factor in the functioning of plant cell membranes under extreme conditions [5]. Changes in fatty acid composition were related to the resistance to various environmental stresses [6–10]. In the present experiment we studied the influence of single salt solutions on the fatty acid composition of groundnut seedlings during a 10 day period after germination.

RESULTS AND DISCUSSION

Palmitic, stearic, oleic and linoleic acids were the major fatty acids associated with the seedling metabolism of groundnut. The composition of fatty acids usually indicates the mode of utilization of the component fatty acids. If one acid is not metabolized relative to others, it apparently appears that the acid has been synthesized. Oleic acid was the major fatty acid in the groundnut cotyledons throughout the period of germination. Changes in the percentage of linoleic acid, with a higher amount on days 2–4 in the cotyledons possibly indicate its initial utilization in metabolism. Rapid changes in the percentage of individual fatty acids may be due to an interconversion of fatty acids usually associated with seed germination [11].

Salt treatments lowered the percent of palmitic acid and caused an increase in the percent of linoleic acid in the cotyledons (Table 1) and the embryonic axes (Table 2), particularly, during the later days of growth. A clear shift in the pattern of unsaturated fatty acids resulting in a high unsaturated–saturated fatty acid ratio was noticed in 6–10 day old embry-

Table 1. Percent fatty acid composition of the total lipid of control (C), sodium chloride (T_1) and sodium sulphate (T_2) treated groundnut cotyledons (mean of three replications)

Age (days)	Treatment	16:0	18:0	18:1(9)	18:2(9, 12)	Unsaturated–saturated
0		21.7	5.1	61.2	12.0	2.73
2	C	25.7	1.2	59.0	13.9	2.71
	T_1	24.7	3.4	59.8	12.0	2.56
	T_2	17.8	3.6	57.8	20.8	3.67
4	C	16.3	2.1	46.5	34.9	4.42
	T_1	15.1	1.9	45.1	37.9	4.88
	T_2	20.8	2.0	47.4	19.8	3.38
6	C	30.5	3.4	62.0	3.9	1.84
	T_1	23.7	3.6	58.5	14.2	2.66
	T_2	24.7	2.4	64.9	8.0	2.36
8	C	30.3	4.9	60.3	1.5	1.84
	T_1	31.9	2.0	61.2	4.9	1.97
	T_2	28.6	3.2	61.0	7.2	2.14
10	C	26.5	4.4	68.9	—	2.23
	T_1	22.4	2.1	62.6	12.8	3.08
	T_2	17.9	—	57.8	24.2	4.58

onic axes of the treated seedlings and this might possibly be due to an improper utilization and/or preferential synthesis of the unsaturated fatty acids. The latter could, however, be confirmed when quantitative studies of the individual fatty acids are made.

The changes observed in the treated seedlings might be a specific response of the plant to the presence of salts in the medium and an adaptive nature of this response could be explained, when studies are made with other species differing in their tolerance. However, changes in fatty acid composition have been related to tolerance mechanisms in other environmental stresses [6, 7, 12] and increasing concentration of unsaturated fatty acids in membranes are said to favour potassium permeability while the sodium permeability is hardly affected [13].

EXPERIMENTAL

Plant material. Seeds of *Arachis hypogaea* L. var TMV 2 procured from the Oil Seeds Research Station, Kadiri (A.P.) were allowed to germinate in Petri dishes in the dark at 28° ± 2°. The plates were lined with Whatman No. 1 papers moistened with H_2O (control) and with 70 meq/l. NaCl and Na_2SO_4 solns equilibrated with equimolar concns of $CaCl_2$.

Lipid extraction. Cotyledons and embryonic axes were separated at 2 day intervals up to day 10 and total lipids extracted using the method of ref. [14]. The lipid residue was washed as described in ref. [15].

Table 2. Percent fatty acid composition of the total lipid of control (C), sodium chloride (T_1) and sodium sulphate (T_2) treated groundnut embryonic axes (mean of three replications)

Age (days)	Treatment	16:0	18:0	18:1(9)	18:2(9, 12)	Unsaturated–saturated
0		55.1	—	39.4	5.5	0.81
2	C	28.5	—	38.6	32.9	2.51
	T_1	35.2	—	43.5	21.3	1.84
	T_2	47.3	—	45.1	7.6	1.12
4	C	80.2	3.6	16.2	—	0.19
	T_1	82.0	1.9	16.1	—	0.19
	T_2	80.0	3.4	15.8	0.8	0.20
6	C	76.0	1.8	20.4	1.8	0.29
	T_1	49.5	4.2	32.9	13.4	0.86
	T_2	32.9	6.0	36.1	25.0	1.57
8	C	81.2	3.2	12.0	3.6	0.18
	T_1	42.1	2.6	28.5	26.8	1.24
	T_2	35.1	2.1	32.6	29.6	1.65
10	C	68.0	8.4	23.6	—	0.31
	T_1	28.1	22.0	41.0	8.9	1.00
	T_2	21.7	24.6	44.0	9.7	1.16

Preparation of methyl esters of fatty acids. Lipid samples *ca* 10 mg were methylated [16] in a special extraction flask. Methyl esters were analysed by GC at 200° on a 2 m glass column packed with 6% diethylene glycol succinate on diatoport S with N_2 as carrier. The peaks were identified by comparison with known standards. Percentages of individual fatty acids were calculated by triangulation.

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METHYL HEXADECA-6,8,12-TRIEN-10-YNOATE FROM *CHRYSOCOMA TENUIFOLIA**

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Key Word Index—*Chrysocoma tenuifolia*; Compositae; acetylenic compound; methyl hexadeca-6,8,12-trien-10-ynoate.

Abstract—*Chrysocoma tenuifolia* afforded a new C_{16}-acetylenic ester.

Chrysocoma is a South African genus belonging to the tribe Astereae. Three species have been investigated previously [1], two of them afforded acetylenic esters with an unusual C_{16}-chain. A reinvestigation of *C. tenuifolia* Berg., collected in Transvaal, only gave one such ester, the enynediene, **1**, as followed from the spectroscopic data. While from the UV maxima the nature of the chromophore could be deduced, the molecular formula clearly showed the presence of a C_{16}-ester. The positions of the double bonds, however, could not be indicated from the fragmentation pattern. The ^1H NMR spectrum (Table 1) clearly showed that all three double bonds were *trans*-configurated, while the position of the double bonds could be assigned by careful spin decoupling. Starting with the signal of the terminal methyl group the signal of H-15 could be assigned. Irradiation of

$MeCH_2CH_2CH{=}CHC{\equiv}CCH{=}CHCH{=}CHCH_2CH_2CH_2CH_2CO_2Me$ **1**

$MeCH{=}CH(C{\equiv}C)_2(CH{=}CH)_2(CH_2)_4CO_2Me$ **2**

$Me(C{\equiv}C)_3(CH{=}CH)_2(CH_2)_4CO_2Me$ **3**

*Part 263 in the series "Polyacetylenic Compounds". For Part 262 see Bohlmann, F., Ahmed, M., King, R. M. and Robinson, H., *Phytochemistry* (in press).