

Weathering Effects on Chinese Tallow Fruit Lipid Content

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ABSTRACT

The lipid contents and fatty acid compositions of freshly ripened and weathered Chinese tallow fruits were examined. After weathering for a year, the shell lipids, including all unsaturated fatty acids, and the seed lipids, including some polyunsaturated fatty acids, decreased by 33% and 7%, respectively. Rainfall during growth affected fruit yield but not lipid contents.

INTRODUCTION

The growing energy problem has brought about the consideration of many plants as possible renewable energy sources (1). Among these plants is the Chinese tallow tree (*Sepium sebiferum*), which produces fruit high in saturated and unsaturated lipids (2,3) to yield up to 12 barrels of oil per acre (4). The characteristics of this oil have been studied (2,5,6). This communication reports the effects of timing of harvest or weathering on the lipid content and an observation of the effect of rainfall on seed yields.

EXPERIMENTAL

Fresh tallow seeds (collected before discoloration) were taken from the tree during the last week in November, 1979 and 1980 (designated groups A and B, respectively) from random locations around Mamou, LA. Fallen tallow seeds (group C) were collected from the 1979 crop (distinguished from one-year seeds by texture and coloration). Seeds with a year of weathering (group D) on the tree were collected during the last week in November, 1980 (seeds from 1979 crop). The total lipid (2,7) and water contents were determined gravimetrically. The major fatty acids were methylated with $\text{CH}_3\text{OH}/\text{BF}_3$ and determined by gas chromatography. The overall pattern and minor fatty acid constituents were determined by thin layer and gas chromatography (6).

RESULTS AND DISCUSSION

In the 1980 growing season, trees along fence rows and drainage ditches were sparsely bearing, while isolated young trees had no seeds at all. The low yield, estimated to be less than 30% of the 1979 and 1981 yields, was attributed to the lack of rainfall (8), which for the growing months of June through September for the years 1979, 1980, 1981 was 18.75, 7.30 and 18.43 in., respectively. Although the seeds fell continually, it was estimated that 10-15% from the 1978 and 1979 crops remained on the trees for one year. Very few, however, (estimated at less than 1%) from the 1980 crop were found on the trees in November, 1981. The low number of 1980 seeds remaining on trees was

probably rainfall related.

The total lipid and water contents for shells and seeds, along with average seed weight, are given in Table I. The shells of groups C and D had a lipid loss of 13 and 33%, respectively, when using group A as the reference. The lipid content of the deshelled seeds of groups A, B and C were essentially the same, with D showing only a 7% loss with respect to A.

The lipid distribution (Table II) for the seeds shows no significant differences for groups A, B and C, with group D showing a loss of unsaturated fatty acids and a significant increase in C_{18} fatty acid. Thin layer chromatography of the oils from the different groups gave identical profiles and R_f values, but no traces of C_8 , C_{10} and $\text{C}_{10:2}$ fatty acid could be detected in Group D. The shells of group C and D lost essentially all their acids except C_{16} .

TABLE II
Distribution of Major Fatty Acids, % Composition^a

Fatty acids	Seed			Shell		
	A	C	D	A	C	D
C14	4	4	4.6	ND ^b	ND	ND
C16	35	36	40	70	95	98
C18	3	5	16	4	2	ND
C18:1	12	10	12	10	ND	ND
C18:2	18	15	8	12	ND	ND
C18:3	25	28	20	1.5	ND	ND

^aGroup A, C and D as in Table I.

^bNot detected.

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TABLE I
Total Lipid and Moisture Contents of Shells and Seeds, and Average Seed Weights

Group ^a	Lipid (mg/g)		% Water		Average wt/seed (mg)
	Shell	Seed	Shell	Seed	
A	332 ± 10	540 ± 25	4.5 ± .6	3.2 ± .3	129 ± 5
B	325 ± 4	546 ± 34	5.1 ± .4	3.0 ± .3	134 ± 4
C	290 ± 7	544 ± 28	6.1 ± .6	3.6 ± .4	140 ± 5
D	224 ± 20	505 ± 13	5.6 ± .4	2.9 ± .3	129 ± 2

^aGroup A, 1979 harvest; B, 1980 harvest; C, seeds fallen from 1979 harvest; D, seeds that remained on the tree from the 1979 crop and harvested in 1980.