

## HYDROCARBONS FROM SEEDS

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Many analyses of the triglycerides in seeds have been published [1,2] but fewer reports are available for the other lipid constituents of seeds [3]. As part of an evaluation of seeds which might be oil-bearing in commercial quantities, the hydrocarbons have been isolated at the same time as the triglycerides.

The seeds were crushed and extracted with petrol and the extract was chromatographed on Si gel to yield a hydrocarbon fraction (usually less than 5% of the total petrol extract), which showed IR absorption at 2952, 2849, 1462 and 1380  $\text{cm}^{-1}$  characteristic of alkanes and the absence of absorption in the carbonyl region. The hydrocarbons were then analysed by GLC on a 1.5 m  $\times$  6 mm column of 1% OV17 on Gas Chrom Z and identified by comparison of their  $R_f$  with standard hydrocarbons

The results of the gas chromatographic analyses are given in the Table 1. Leaf hydrocarbons show a marked alternation, i.e. high proportions of the odd chain length constituents and low proportions of the even chain length with a maximum around  $\text{C}_{29}$  or  $\text{C}_{31}$  [4] (a unimodal distribution) and very little short chain length material. Neither the hydrocarbons of internal leaf lipids nor of seeds normally show such unimodal distributions. Instead they contain significant proportions of short chain material and show little or no odd-even alternation. Thus *Myosotis scorpioides*, *Orbignya oleifera*, *Pastinaca sativa* and *Anthriscus cerefolium* all contain significant pro-

portions of short chain material lower than  $\text{C}_{23}$ . By contrast, the hydrocarbons of carrot, *Daucus carota*, seem to be an exception with no trace of short chain material and appearing more like a leaf alkane fraction

The hydrocarbons from *Shorea stenoptera* and *Orbignya oleifera* seeds are very similar to the internal alkanes of leaves (e.g. in *Solandra grandiflora* [4]) in that they show very little odd-even alternation at the longer chain length. The alkanes of *A. cerefolium* with its high proportion of branched chain  $\text{C}_{17}$  hydrocarbons are reminiscent of the seed coat lipids of *Plantago ovata* [5].

The distributions range from the almost unimodal type (*Oenothera macrocarpa*) through the bimodal distribution (*A. cerefolium*) to an almost unimodal type (*Anchusa azurea*) where the major constituent is a  $\text{C}_{17}$  component

It appears that the seed hydrocarbons present a variety of distributions just as the leaf lipids do and that they merit further study

## REFERENCES

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Table 1 Hydrocarbon composition of the seeds of Angiosperms

Plant	Family	Hydrocarbon chain length																
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
<i>Anchusa azurea</i>	Boraginaceae												6.8		5.1		1.4	
<i>Anthriscus cerefolium</i>	Umbelliferae	81.4																
<i>Daucus carota</i>	Umbelliferae	36.3							2.5					1.7	1.6	72.8		
<i>Helianthus annuus</i>	Compositae	3.3	2.1	5.2	1.5	3.9	7	2.6	3	1.5	1.7	1.4	2.9		23.4		50.1	
<i>Myosotis scorpioides</i>	Boraginaceae			2.5		12.7		11.7	16.7	9.4			5.6	5.6	9.1			
<i>Oenothera macrocarpa</i>	Onagraceae					2.1	5.7		7.6	2.9	14.3	1	21.0		27.8		18.3	
<i>Orbignya oleifera</i>	Asteraceae	5.7	2.3	8.2	4.0	8.8	5.7	7.2	7.4	7.8	7.2	5.2	7.2	4.1	7.5	3.0	6.7	1.4
<i>Pastinaca sativa</i>	Umbelliferae					88.2							0.7	1.0	7.4		2.5	
<i>Shorea stenoptera</i>	Dipterocarpaceae	30.8	4.2	7.4	5.5	8.9	2.0	2.3	5.4	2.5	4.2	2.8	4.3	3.4	3.4	2.8	2.3	1.7

Figures 16-36 are % of total hydrocarbons. Figures 37-40 are % of total hydrocarbons. Figures 41-44 are % of total hydrocarbons. Figures 45-48 are % of total hydrocarbons. Figures 49-52 are % of total hydrocarbons. Figures 53-56 are % of total hydrocarbons. Figures 57-60 are % of total hydrocarbons. Figures 61-64 are % of total hydrocarbons. Figures 65-68 are % of total hydrocarbons. Figures 69-72 are % of total hydrocarbons. Figures 73-76 are % of total hydrocarbons. Figures 77-80 are % of total hydrocarbons. Figures 81-84 are % of total hydrocarbons. Figures 85-88 are % of total hydrocarbons. Figures 89-92 are % of total hydrocarbons. Figures 93-96 are % of total hydrocarbons. Figures 97-100 are % of total hydrocarbons. Components of less than 1% are represented as T (Trace) or B (Branched).