EXPERIMENTAL

Isolation of the volatile substance Twelve kg of the defatted powdered herb of *S tetrandra* were moistened with 25% NH_4OH and packed in a glass percolator with $(CH_2Cl)_2$ The powder was allowed to extract for 24 hr, then the solvent was allowed to percolate, till a few milliliters gave negative alkaloidal test The extract was evaporated under reduced pressure below 45° The concentrated extract was left in a refrigerator for a few days when long needles separated These crystals were washed several times with petroleum and recrystallized several times from $(CH_2Cl)_2$ (yield about 0 05%) This was identified as methyl carbamate as described above

Detection of methyl carbamate in the other Salsola *species* Each sample (100 g) was subjected to alkaline steam distillation using 10% NaOH The steam distillate was received in dilute HCl, evaporated under vacuum and the concentrate in each case was applied to Whatman No 1 paper along with authentic methyl carbamate using BAW (50 1 49 and 5 1 4), detection with *p*-dimethylaminobenzaldehyde and ninhydrin Each of the investigated *Salsola* species gave the same spot having the same R_f and colour

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Key Word Index—*Salsola*, Chenopodiaceae, methyl carbamate

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COMPOSITAE

ALKANES OF THREE *ARTEMISIA* SPECIES

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IT HAS been suggested by Eglinton[1] that the hydrocarbon waxes may be of some use in the chemotaxonomy of closely related genera Little work has been done on members of the Compositae and virtually no chemotaxonomic correlations have been made [2] In our investigations of the chemical constituents of *Artemisia* we have isolated and examined the total alkanes from aerial parts of three local *Artemisia* species, *A ludoviciana* Nutt Var *gnaphaloides* Nutt , *A cana* Pursh and *A frigida* Wild. All of these plants were collected while in full bloom so that variation due to the extent of development should play little role in alkane comparisons. *A ludoviciana* and *A frigida* are fairly widespread in the Canadian prairies whereas *A cana* is relatively restricted to a few dry saline areas

In all three species the odd numbered straight chain hydrocarbons form by far the

* Abstracted in part from the thesis of A B Paralikar submitted to the University of Calgary for the Ph D degree (1970)

[1] G EGLINTON, R. J HAMILTON and M MARTIN-SMITH, *Phytochem* **1**, 137 (1962)

[2] G EGLINTON and R J HAMILTON, in *Chemical Plant Taxonomy* (edited by T SWAIN), Chap 8, Academic Press, New York (1963)

majority of the hydrocarbon waxes No even number hydrocarbon occurs to as much as 1 per cent As can be seen in Table 1 the C_{27}, C_{29} and C_{31} straight chain hydrocarbons are the predominant constituents with C_{29} being the major constituent in all cases A trace of the C_{33} hydrocarbon was found in *A ludoviciana* but not in either of the other two species No higher molecular weight or branched chain hydrocarbons were identified in any of the three species

Although there are obvious significant differences between the amounts of the specific constituents of these species, the overall patterns are quite similar We are in the process of investigating other species to see if this pattern is widespread in the genus

TABLE 1 *n*-ALKANES IN THREE *Artemisia* SPECIES

Hydrocarbon No	*A ludoviciana* (%)*	*A frigida* (%)*	*A cana* (%)*
19	1 9	—	Trace
20	<1 0	Trace	Trace
21	2 6	3 7	3 6
22	<1 0	<1 0	<1 0
23	4 1	7 7	4 5
24	<1 0	<1 0	<1 0
25	5 2	14 3	4 7
26	<1 0	<1 0	—
27	8 7	15 7	15 7
28	<1 0	<1 0	<1 0
29	38 4	40 8	50 0
30	<1 0	<1 0	<1 0
31	38 9	17 7	21 3
32	—	—	—
33	Trace	—	—

* These values are percentages of the total alkane fraction

EXPERIMENTAL

Extraction and isolation of hydrocarbons The aerial parts of *Artemisia frigida* (6 kg) were collected at the height of their blossoming period, dried and ground The ground material was extracted with hexane in a Soxhlet for 24 hr and the solvent removed *in vacuo* The residue (128 g) was subjected to steam distillation to remove the essential oils and the non-steam distillable residue was taken up in $CHCl_3$ This extract was concentrated to dryness and the residual gum (80 g) was chromatographed over 1600 g of alumina (Act I, neutral) and eluted with hexane (10 × 1 l) Removal of the hexane *in vacuo* left 14 g of a hydrocarbon mixture

Identification of hydrocarbons The hydrocarbons were identified by GLC on a Hewlett-Packard Model 402 Bioresearch chromatograph using a 6′—3 8 % SE30 on chromosorb W column at oven temp of 150° and 290° Standard hydrocarbons were obtained from Analabs[3] and the plant alkanes were identified by a log plot of hydrocarbon number vs retention time Two temperatures were used at different attenuations in order to get all peaks on scale, rather than a single attenuation value and a programmed chromatograph

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[3] ANALABS, Conn 06473, U S A

Key Word Index—Artemisia, Compositae, *n*-alkanes