

decreased in the extracted oils of German and French varieties, 17.2% and 19.2% respectively. The previous results are in good agreement with Farag et al. (1986).

However, it is desirable to lower the balance of the fatty acids (TU/TS) present in this oil since its content of saturated and essential fatty acids i.e. (C_{18:2}) and (C_{18:3}) are relatively low when compared with other vegetable edible oils. Nevertheless, many workers had reported that rapeseed is unbalanced oil, Kramer and Sauer (1987). They mentioned that the balance of fatty acids in rapeseed oil is highly undesirable since, the quantities of saturated and the essential fatty acids (C_{18:2} in particular) were markedly lower than the common edible oils. Also, Farag et al. (1986) stated that there is a considerable risk in using rapeseed oil for human consumption owing to its unbalanced fatty acids content. It contains the lowest values among other edible oils in saturated and essential fatty acid. Vles (1975) stated that the poor digestibility and utilization of rapeseed oil has been ascribed to its low level of saturated fatty acids and its high content of erucic acid.

III.3. Unsaponifiable matter of rapeseed oils (German and French Varieties):

The crude oils of rapeseed (German and French Varieties) isolated through hot hexane, Skysylof and pre-pressing methods were subjected to the same chemical treatment to isolate its unsaponifiable matter contents. Characterization of these constituents were carried out by the use of GLC technique.

Authentically pure samples of sterols (B-sitosterol, stigmasterol and campesterol) and different hydrocarbons (from C_{12} to C_{32}) were served as standards. The obtained data are presented in Tables (13 and 14) and the corresponding chromatograms are illustrated in Figures (5, 6 and 7) for German and French varieties respectively.

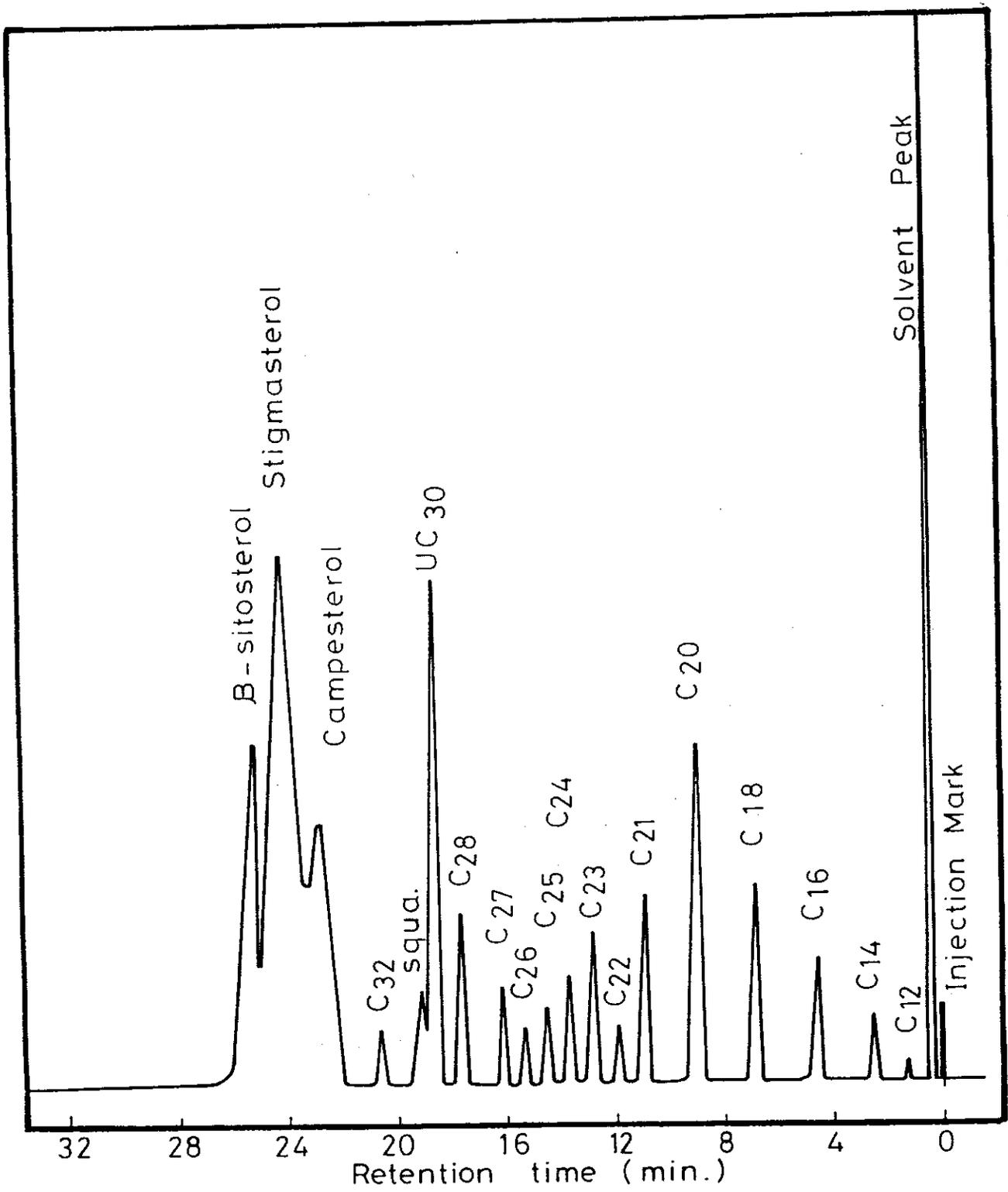
The hydrocarbon of the German variety constituted the major part of the unsaponifiables which contained 14 different components amounted from 81.61 to 82.14% of the total unsaponifiable matter. Oils of rapeseed under investigation, Table (13) contained (C_{28}) as a major constituent ranged from 52.28 to 53.47% while the two compounds C_{20} and C_{26} were present in moderate amounts. Moreover, other hydrocarbon compounds were found in relatively small amounts.

B-sitosterol, stigmasterol and campesterol were detected in the different extracted oil of German variety, their

Table(13): Unsaponifiable composition of rapeseed oil
(German variety) extracted by various methods.

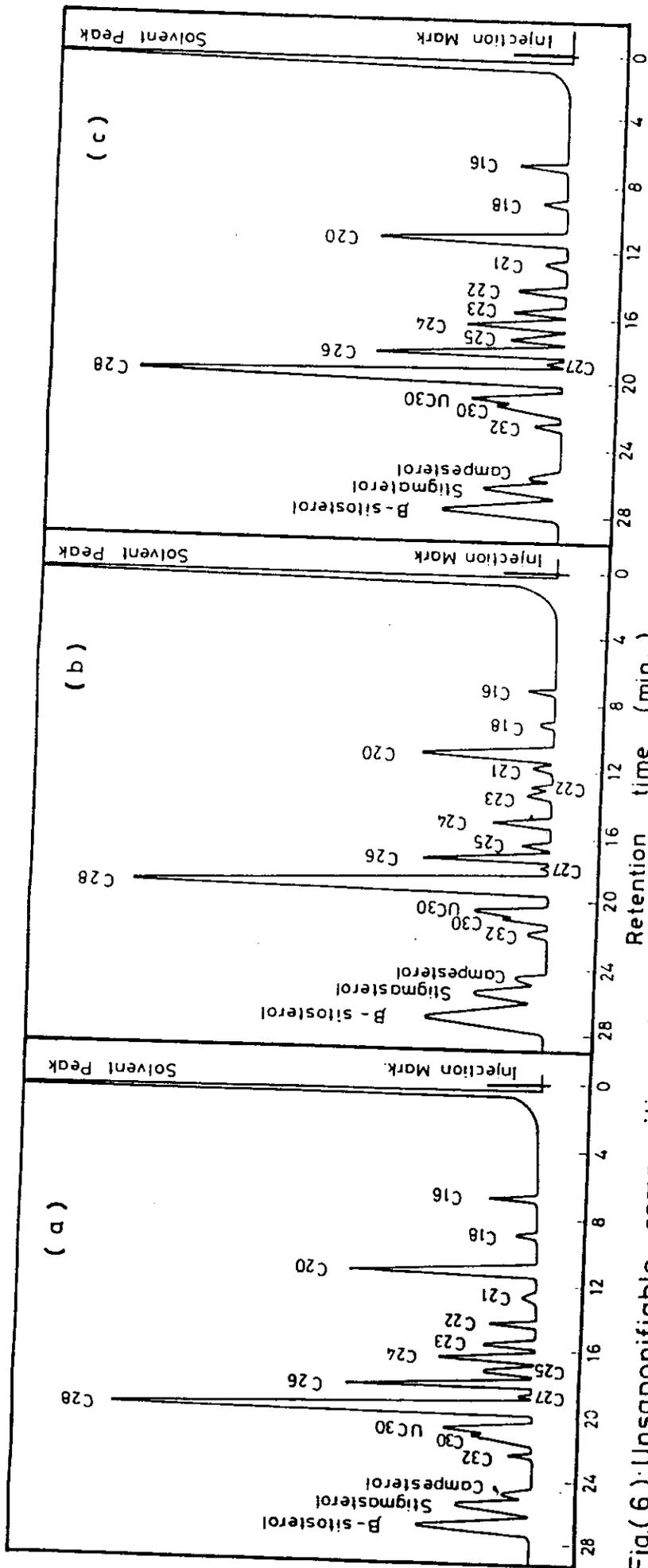
Components	Extraction methods		
	Hot hexane	Skysylof*	Pre-pressing
C ₁₆	0.70	0.63	0.71
C ₁₈	0.39	0.42	0.39
C ₂₀	8.17	7.91	8.89
C ₂₁	0.18	0.16	0.14
C ₂₂	0.50	0.61	0.53
C ₂₃	0.90	0.91	0.91
C ₂₄	2.93	3.40	3.31
C ₂₅	1.85	1.61	1.64
C ₂₆	7.21	7.70	7.61
C ₂₇	tr	tr	tr
C ₂₈	53.47	53.37	52.28
UC ₃₀	2.17	2.05	2.43
C ₃₀	2.14	2.30	2.43
C ₃₂	1.00	1.07	1.07
Campesterol	2.76	2.68	2.46
Stigmasterol	5.65	5.09	5.81
B.Sitosterol	9.97	10.08	9.38
Total hydrocarons%	81.61	82.14	82.34
Total sterols%	18.38	17.85	17.65

* Skysylof : chloroforme : methanol : H₂O (2:1:0.8)



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Fig.(5) GLC Chromatogram of standard unsaponifiable matters.



Fig(6): Unsaponifiable composition of rapeseed oils (German variety) extracted by :
 a) hot hexane
 b) skyslyof method and
 c) pressing method .

total amounts ranged from 17.65 to 18.38%. Plant sterols, *B*-sitosterol and stigmasterol were the main sterol constituents in all oil samples of German variety and ranged from 9.38% to 10.08% and from 5.09% to 5.65% respectively. Campesterol was presented in small amounts ranged from 2.46% to 2.76%. The previous results regarding hydrocarbons and sterols are almost in agreement with those reported by El-Khawas (1988). The unsaponifiable matter of the crude oils of the French variety extracted by various methods are presented in Table (14) and Figure (7). The obtained data showed that the hydrocarbon amounts ranged from 77.21 to 77.93% of the total unsaponifiables. The crude oils extracted through various methods of this variety contained the hydrocarbon compound (C_{24}) as the predominant one since it ranged from 39.97 to 42.16%. C_{23} and C_{32} were present in moderate amounts, ranged from 10.4 to 10.83% and 10.8% to 10.86% respectively. Other hydrocarbons and squalene compound were found in relatively small amounts.

The obtained data in Table (14) showed that sterol content of the unsaponifiable matter ranged from 22.07 to 22.79%. Both *B*-sitosterol and stigmasterol were present as the main sterol constituents which ranged from 13.18 to 13.92% for the former and from 6.02 to 6.66% to the latter. Moreover, campesterol fraction was presented in small amounts and reached to 2.52% in crude French rapeseed

Table(14): Unsaponifiable composition of rapeseed oil
(French variety) extracted by various methods.

Components	Extraction methods		
	Hot hexane	Skysylof*	Pre-pressing
C ₁₆	0.99	0.90	0.87
C ₁₈	0.20	0.31	0.28
C ₂₀	1.34	1.64	1.60
C ₂₁	0.59	0.61	0.60
C ₂₂	0.62	0.58	0.58
C ₂₃	10.60	11.40	10.83
C ₂₄	42.16	39.97	40.10
C ₂₅	0.68	0.70	0.69
C ₂₆	3.56	3.48	3.50
C ₂₇	tr	tr	tr
C ₂₈	1.19	2.20	2.30
UC ₃₀	3.29	3.26	3.21
C ₃₀	1.13	2.08	2.06
C ₃₂	10.86	10.80	10.85
Campesterol	2.52	2.23	2.08
Stigmasterol	6.35	6.66	6.02
B.Sitosterol	13.92	13.18	14.43
Total hydrocarbons%	77.21	77.93	77.47
Total sterols%	22.79	22.07	22.53

* Skysylof = chloroforme : methanol : H₂O (2:1:0.8)

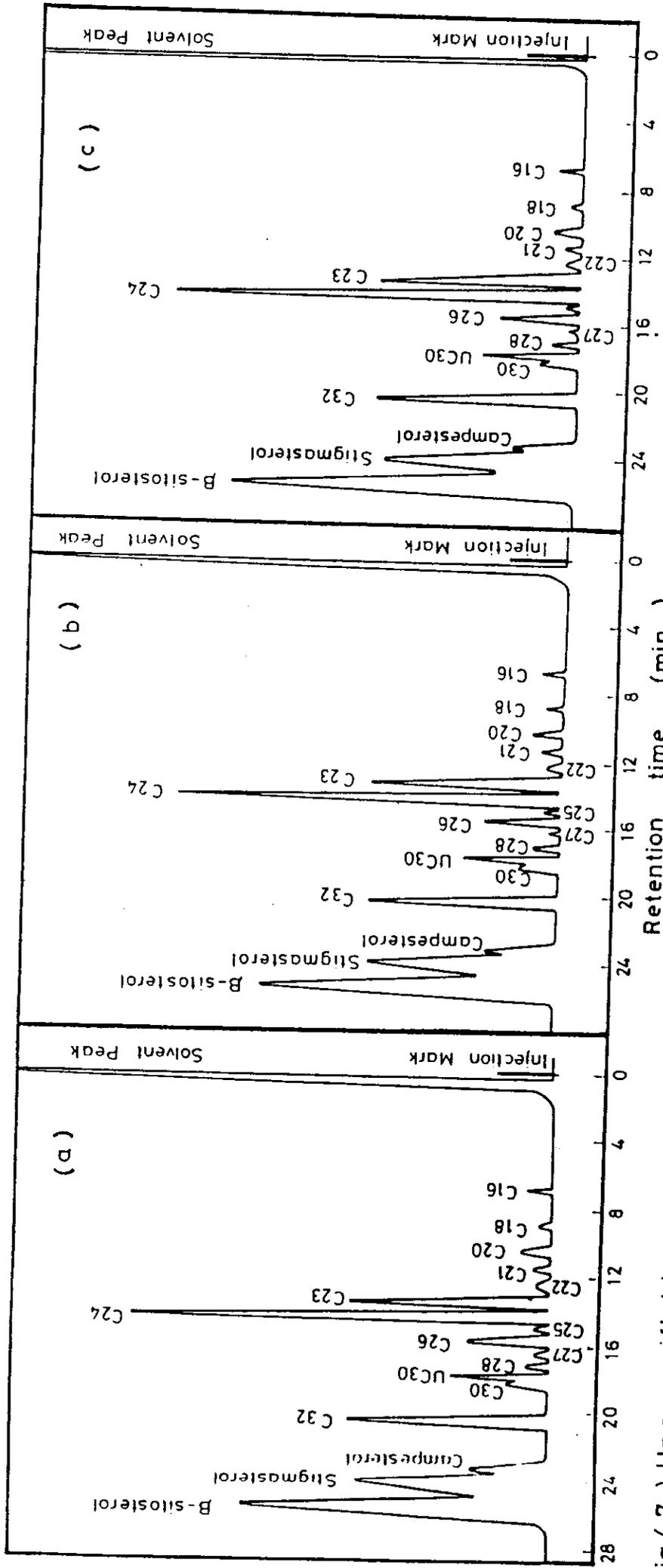


Fig.(7): Unsaponifiable composition of rapeseed oils (French variety) extracted by: a)) hot hexane b)) skysylof method and c)) prepressing method