Qatar Univ. Sci. Bull. (1985), 5:371-76

CONSTITUENTS OF PLANTS GROWING IN QATAR X.* SEASONAL VARIATIONS OF THE VOLATILE OIL OF *CYMBOPOGON PARKERI*

By
A.M. RIZK*, H.I. HEIBA,*, M. MASHALY*** and P. SANDRA**
*Scientific and Applied Research Centre,
University of Qatar.
**Laboratory of Organic Chemistry,
University of Ghent.
***Faculty of Science
Domiat, Egypt

Key Words: *Cymbopogon parkeri*, volatile oil, seasonal variation, hydrocarbons, alcohols, carbonyl compounds, esters.

ABSTRACT

The seasonal variation of the volatile oil of *Cymbopogon parkeri* Stapf. was studied. The oil content is higher during the hot dry season than during the humid hot season and the cold season. No qualitative differences among the monthly collected samples were observed but the quantity of the individual compounds varied strongly. The oil is characterized by a high content of alcoholic terpenes with nerolgeraniol representing 45 to 73 percent of the oil.

INTRODUCTION

Cymbopogon parkeri Stapf. (local name Skhabar) is a perennial aromatic plant that is very common, particularly in central and northern Qatar (Batanouny, 1981).

The analysis of the essential oil by means of capillary gas chromatography and mass spectrometry has recently been described (Rizk *et al.*, 1983). In this study a correlation is made between the picking time and the essential oil content. The quality and quantity of the individual constituents among monthly collected samples was followed.

EXPERIMENTAL

100 g amounts of the plant, monthly collected, were subjected to water distillation (boiling and distilling with water without introducing steam from an outside source). The yield of the oil was calculated on the basis of dry material.

Gas chromatographic analysis was carried out on FSOT capillary column (30 m × 0.32 mm) coated with SE-54 and installed in a Carlo Erba 4160. Quantitation was performed on a Varian CDS 111 integrator.

*Part IX: Rizk, A.M., Rimpler, H., Ghaleb, H., and Heiba, H.I., Intern. J. Crude Drugs (In Press).

RESULTS AND DISCUSSION

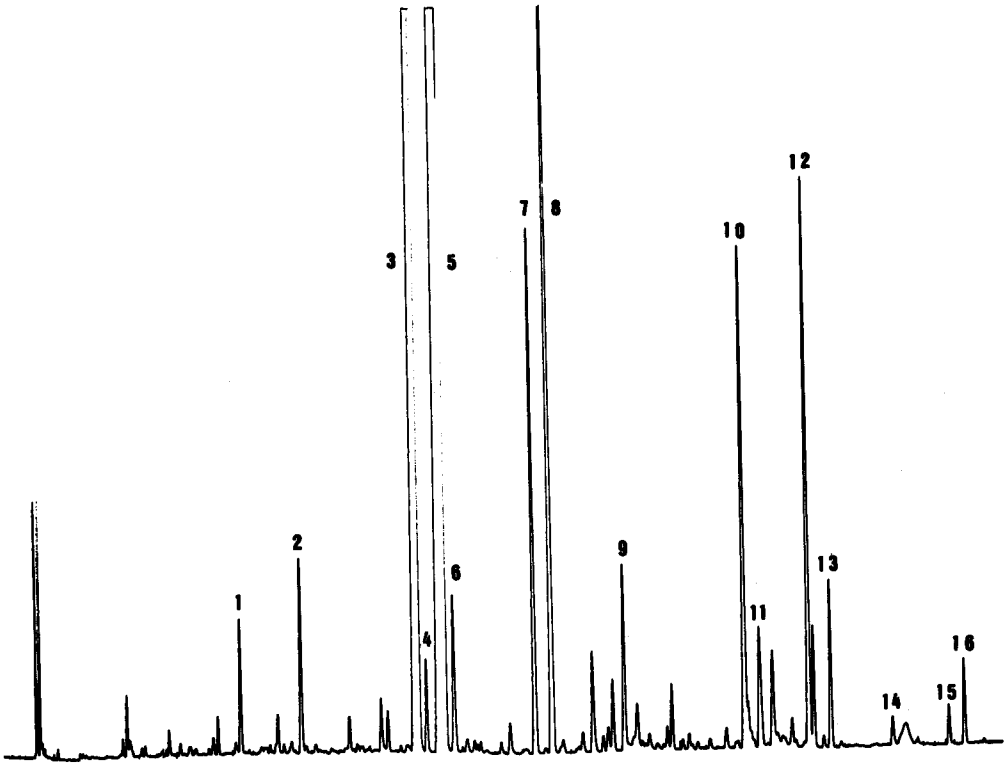
Twelve oil samples, representing the months of the year 1982, were collected. The average yield of oil is about 0.9%. If fluctuates from 0.54% in September to 1.55% in May. Table (1) shows that the yield of volatile oil during the dry hot season (March to May) is higher than during the humid hot season (June to October) and the cold rainy season (November to February).

Table (1)
The percentages of the oil and the different classes through the year 1982

Month	Oil*	Hydrocarbons	Alcohols	Carbonyl Compounds	Esters
January	0.58	1.48	82.98	4.17	11.37
February	1.3	1.38	90.7	0.6	7.31
March	1.42	3.91	80.94	1.59	12.52
April	1.51	2.10	72.88	5.39	19.64
May	1.55	1.13	72.29	4.09	17.47
June	1.3	3.57	75.48	4.11	16.81
July	0.79	2.17	78.04	4.26	15.53
August	0.66	0.13	92.57	0.85	6.26
September	0.54	1.91	68.83	14.24	14.71
October	0.82	2.45	77.35	6.92	13.26
November	0.60	4.09	76.0	4.04	15.87
December	0.93	1.09	90.22	1.91	6.76

*Calculated on the basis of dry material.

Comparing the profile of each sample, as obtained with capillary gas chromatography revealed that no qualitative differences among the samples could be detected. A typical chromatogram e.g. the essential oil of May, 1982 is represented in Figure (1). To study the quantitative differences the compounds represented in Table (2) were selected. They represent the main compounds and also the different chemical classes identified oil of Cymbopogon parkeri. The quantitative variations of the sixteen compounds through the year 1982 are enlisted in Table (2). Table (1) presents the varitions in the chemical classes hydrocarbons, alcohols, carbonyls (aldehydes and ketones) and esters.



The analyses showed that the alcoholic constituents are the predominant compounds and the hydrocarbons are the minor ones. The esters are of low concentration, but relatively higher than that of the carbonyl compounds. Generally the order of concentration among these different classes is as follows: Alcohols >>> Esters >> Carbonyl compounds > Hydrocarbons.

Limonene, hydrocarbon fraction, is always of very low concentration. It showed a maximum concentration (4.09%) in November and a minimum concentration (0.13%) in August.

Regarding the ester compounds the lower ester(s), i.e. the acetates are of higher concentration than the higher ones, i.e. hexanoates-octanoates. Among the higher esters, the order of concentration is octanoate(s) > hexanoate(s) > heptanoate(s). The esters of both nerol and geraniol are the most common compounds.

Table 2

Percentage of selected contituents through 1982

No.*	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Limonene	1.48	1.38	3.91	2.10	1.13	3.57	2.17	0.13	1.91	2.45	4.09	1.09
2	Linalool	1.46	1.34	1.48	0.97	1.68	1.67	2.99	0.91	2.56	1.40	3.22	0.25
3	Nerol	28.40	27.86	30.24	25.74	25.54	29.78	23.79	24.28	19.74	19.71	20.56	39.93
4	Neral	0.84	0.78	0.40	0.70	0.69	1.15	1.30	0.27	3.76	1.84	0.81	0.41
5	Geraniol	24.24	42.81	29.92	19.15	38.58	21.93	31.70	48.22	28.21	31.72	35.63	31.30
6	Geranial	2.82	0.113	0.93	1.63	1.48	1.69	2.44	0.38	8.32	3.85	2.16	1.37
7	Neryl acetate	7.22	2.23	8.48	11.91	4.35	9.01	4.33	2.15	4.16	5.06	4.35	4.32
8	Geranyl acetate	2.47	3.59	3.02	6.29	10.25	4.50	9.13	2.86	6.73	6.92	9.55	1.38
9	12-Methyltridecanone	0.51	0.41	0.26	0.36	1.91	1.27	0.52	0.20	2.65	1.23	1.07	0.13
10	Sesquiter. alc. (M.W.222)	15.0	12.75	11.59	13.78	5.54	11.24	8.75	11.50	8.39	12.98	7.38	11.71
11	Eudesmol (t)	6.48	3.35	2.77	6.44	1.64	5.0	2.75	5.63	3.14	4.40	2.20	4.41
12	Farnesol	7.39	2.59	4.94	6.80	4.31	5.86	8.06	2.03	6.59	7.14	7.01	2.62
13	Geranylhexanoate	0.29	0.78	0.25	0.16	1.25	0.68	0.41	1.04	1.46	0.25	0.40	0.15
14	Geranyl heptanoate	0.14	0.10	0.22	0.53	0.32	0.44	0.39	<0.10	0.69	0.10	0.34	0.15
15	Neryl Octanoate	0.94	0.20	0.29	0.57	0.41	1.41	0.34	<0.10	0.56	0.43	0.28	0.59
16	Geranyl octanoate	0.31	0.41	0.26	0.18	0.89	0.81	0.93	0.21	1.11	0.50	0.95	0.17

* See Fig. (1)

t : Tentative

The carbonyl compounds aldehydes (neral and geranial) and Ketones (12-methyltridecanone), showed a very low concentration among the oil constituents. Their order of oncentration is geranial > neral > 12-methyltridecanone. Neral and geranial have the same trend of behaviour along the year while 12-methyltridecanone deviates from this general trend only between the months May-July.

The alcoholic compounds are the most predominant as both a chemical class and as an individual compound(s). The general order of concentration among these alcohols is Geraniol-Nerol > unknown sesquiterpene (M. wt. 222)> Farnesol > Eudesmol > Linalool.

Geraniol and nerol showed the highest concentration in August and December respectively. The concentration of geraniol was 48.22 percent while that of nerol was 39.93 percent. Linalool showed the lowest concentration of 0.25 percent in December. There was no noted general trend of behaviour in the concentrations of the alcohols throughout the year; though the alcohols did show similar trends during several short intervals.

The oil is unique in that it contains the alcoholic, aldehydic and ester forms of nerol and geraniol. Their order of concetration is; Alcohol >> Acetate > Aldehyde > C_6-C_8 esters.

REFERENCES

Batanouny, K.H. 1981. Ecology and Flora of Qatar, Centre for Scientific and Applied Research, Alden Press, Oxford, U.K.

Rizk, A.M., H.I. Heiba, P. Sandra, M. Mashaly and **C. Bicchi, 1983.** Constituents of plants growing in Qatar. V. Constituents of the volatile oil of *Cymbopogon parkeri,* J. Chromatogr., 279; 145-150.

دراسة المكونات الكيميائية لنباتات دولة قطـــر

الجزء العاشر : دراسة التغيرات الموسمية للزيت الطيار لنبات الأسخبر

عبد الفتاح محمد رزق و حلمي إسماعيل هيبة و مشالي . و ب . ساندرا

درس التغير الموسمي للزيت الطيار لنبات الأسخبر من خلال تحليل عينات الزيت لكل شهر خلال عام ١٩٨٢م وقد تراوحت نسبة الزيت بين ٥٤ر٠٪ في شهر سبتمبر إلى ٥٥ر١٪ في شهر مايو . اسفرت الدراسة عن عدم وجود اختلاف نوعي بالنسبة للمركبات . بينما وجد هناك اختلافات متباينة خاصة بنسب هذه المركبات .

يتميز الزيت باحتوائه على نسبة عالية من التربينات الكحولية مثل النيرول ، الجرانيول التي تمثل من ٤٥ ـ ٧٣٪ من الزيت .