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by

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Determination of the Pyrethrin Content of the *Chrysanthemum cinerariaefolium (Compositae)* Cultivated in the Central Anatolia

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ABSTRACT

Chrysanthemum cinerariaefolium seeds from Kenya were cultivated in the Central Anatolia. The pyrethrins were extracted by chloroform from the flower heads of the second and third years products. The insectiside contents were determined by gas chromatography.

INTRODUCTION

Pyrethrin, cinerin and jasmoline are the esters of pyrethric acid and chrysanthemic acid which are contained in the flower heads of Chrysanthemum species and are very important insecticides. Alcohol compenents of these esters are cineralon, jasmolone and pyretrolone.

Chrysanthemum has many different species and some of them are among the natural flora of Turkey as are shown in Table 1.

C. cinerariaefolium has the highest pyrethrin content among the investigated species of the genus in this respect. Its homeland is Western Yugoslavia (Dalmatia). In Turkey it is known as (bug powder plant).

It has been cultivated in Japon since 1881 and in Kenya since 1928. The pyrethrin content of the product of Kenya is higher

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Table 1

Distribution of Pyrethum and Chrysanthemum Species in Turkey

	District	Height from the sea leval
1– P.ancherianum D.C.	Erzincan, Refahiye	1760 m
2– P.argenteum Wild.	Stavri	2200 m
3– P.anserinsefolium Hausken-Borum	Trabzon	
4– P.annaefolium Hansken-Borum	Ankara, Beynam orm.	
	Karaçam korusu altı	1400 m
5– P.balsamita L.	Gümüşhane, Bayburt Kap D.	1660 m
6– P.ptarmicaefolium Wild	Konya, Ermenek Oyuklu D.	
	Kaya pınarı çeşmesi	1800 m
7– P.roseum M.Bieb	Rize Cemil dağı	2500 m
8– P.tementellum Boiss.	Gümüşhane	1500 m
9– P.miriophillum Wild	Gümüşhane	1350 m
10– P.macrophyllum Wild	Trabzon	2200 m
11– P.porthenium Sm.	Ankara, Aydos yayl.	
	Ankara, Hasanoğlan yay. İdris dağı	
	Chrysanthemum Species	
1– C.cidicium Bornum.	Adana	1250 m
2– C.armemun (D.C.) Hand Mazz	Bozkar Küçük Geyik dağı	2300 m
3– C.cadmemun (Boiss)	Bozkır, Haydar dağı	1800 m
4– C.argenteum Wild	Erzincan, Eğin	
5– C.coranarium L.	Mersin, Kanlı dere	
6– C.tanacetum Karseli	Ankara, Elmadağ	
7– C.poliphyllum (Boiss)	Hub-Nor. Bitlis	
8– C.saterifolium Bornm.	Kalecik, Kalkan boğazı	150 m
9– C.segetum L.	İstanbul, Mecidiyeköyü	
10– C.parthenium (L) Bernh.	Ankara, Beypazarı	
	Eğriova Develi	1200–1800 m

than Japon and Dalmatian products- (2,3) It was used in malaria control for long years then left its place to D.D.T. and other synthetic insectisides which have the residual handicaps. Pyrethrines are very valuable insecticides being quick-decomposing compounds with no or minumum residual problem. In addition pyretrines have low toxicity to cattle and human beings and no resistancy problem for insects.

The aim of the present investigation has been to determine pyrethrin content of the pyrethrum flowers (cinerariaefolium) cultivated in Central Anatolia which is not convenient for the cultivation of the other well known export product of Turkey.

Experimental

a– Cultivation

The seeds were sown on the October 1976 at the experimental farm of the Refik Saydam Hygien Institute. It was harvested yearly 3.5–5.0 kg fresh flower from 40 roots usually 230–240 flowers from one root and 270 ones as extraordinarily. The 1977 product has not been analyzed. The products of the second (1978) and third year (1979) were used in determination of the insectiside content.

b– Drying.

Harvested flovers were spread out on felt and kept in shadow for 3 days then dried under sunshine. The amount of the moisture of the sundried flowers were 10 %.

c– Extraction of the pyrethrins.

25 gr C. cinerariaefolium flowers were crushed in a mortar. The fine powder was extracted with 125 ml of chloroform by stirring mechanically at room temperature. The extract was filtered through Whatman 42 filter paper. The solvent was removed in a vacuum evaporator and residue was taken by n-hexane.

d– Clean-up.

Cleaning of the pyrethrin from the impurities was carried by column chromatography. A column with a diameter of 20 mm was filled with (5 g anhydrous sodium sulphate + 20 g of Florisil + 5 g anhydrous sodium sulphate), washed with 100 ml of n-hexane and was filled with n-hexane to the top level of adsorbent. The hexane solution of pyrethrum extract was added to the column. Washed with 75 ml of n-hexane and pyretrines were eluted by 125 ml acetone. Acetone was removed on a steam bath. The residue was taken with 10 ml of carbon disulfide and added to a column filled with anhydrous sodium sulphate. Pyrethrines were elueted by a few mililiters of carbondisulfide to a coloured mesuring flask and diluted to the mark.

e– Preperation of the standard solution (5).

A 0.4 g sample of the Fluka Standard* was weighed into a brown bottle and disolved in 5 ml of n-hexane-This solution was

* 25 % Pyrethrin containing extract from Fluka.

added to a Florisil column which is prepared as above and cleaned-up as it was with the sample solution.

f– Gas chromatograph

A Varian 1400 Model instrument with flame ionization detector was used in determinations. The operating conditions were employed, as fllows:

1– Column:

2 % GE-XE-60 on Chromosorb W AW-DMC-S, 60–100 mesh, packed in a 5 ft x 1/8 in. I.D glass column.

2– Matrix-programmed (6).

The initial oven temperature was 155°C and as soon as the solvent peak appeared the temperature was maintained for 6 min 2 sec. (timed with a stop watch) The temperature was then raised to 185°C at the rate of 20°/min. When the PyI peak reach the maximum height on the recorder chart, the temperature was maintained at 185°C for 2 min 15 sec; the temperature was then raised to 215°C at the rate of 20°/min and maintained at this temperature until PyII peak and other subsequent peaks appeared on the recorder chart.

3– The other operating conditions were:

Injection temperature	:	208°C
Dedector "	:	250°C
Chart speed "	:	0,5 cm/min.
N_2	:	10 ml/min.

g– Quantitative analysis.

The calibration curves were prepared using the above standard solution. Different amounts of this solution were injected to the column and chromatograms were recorded under the above conditions.

The calibration curves were obtained by plotting of the peak areas versus the amounts of standard.

RESULTS AND DISCUSSION

As the avarage of three determinations, pyrethrin contents were found as follows:

	2. year:	3. year
Total pyrethnum	% 036	% 038
Total pyrethrins I	% 61,17	
Total pyrethrins II	% 38,83	

Pyrethrins I/Pyrethrins II = 1,5

Composition of the extract was found as below:

		Central Anatolian Pyrethrum extract	Kenian pyrethrum extract (3)
	Cinerin I	% 13,2	% 14,8
Pyrethrins I	Jasmolin I	% 9,2	% 8,1
	Pyrethrin I	% 77,6	% 77,1
	Cinerin II	% 19,65	% 23,0
Pyrethrins II	Jasmolin II	% 9,15	% 7,8
	Pyrethrin II	% 71,2	% 69,2

Total pyrethrine content of the Central Anatolian *C. cinera-raefolium* has been found the same as the Central Anatolian *Pyrethrum roseum* M.B extract (7) But the difference of the ratio Pyrethrine I/Pyrethrum II is important because of the insectiside activity of Pyrethrine I is higher than Pyrethrine II.

Py I/Py II ratios are:

	Py I / Py II
Anatolian P. roseum M.B. (7)	0.80
Anatolian Chrysanhemum cinera-efolium	1.50
Kenian Chrysanthemum (3) cine-rariaefolium	1.00

The total pyrethrin content has been found lower than the world standart may be because of the climate of Central Anatolia. In the investigation of İpekçioğlu and Aksu (8) west Anato-

lion product gave better result with 0.80 % of Pyrethrine content.

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ÖZET

Bu çalışmada Türkiyede yetişmeyen bir Chrysanthemun türü olan Chrysanthemun cinerariaefolium'un tohumları Kenyadan getirtilerek orta Anadoluda üretilmiş ve içerdiği piretrin miktarları gaz kromatografi metadu ile saptanmıştır. Orta Anadolu ürününden elde edilen ekstraktta insektisitçe aktifliği üstün olan Piretrin I fraksiyonunun daha fazla olduğu görülmüştür.

Diğer taraftan Piretrin I ve Piretrin II fraksiyonlarındaki esterlerin yüzdeleri Kenya piretrininin aynıdır. Piretrin yüzdesinin dünya standartlarına göre düşük bulunması muhtemelen orta Anadolu ikliminin sertliğinden ileri gelmektedir.

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