Identification of Biblical Hyssop and Origin of the Traditional Use of Oregano-group Herbs in the Mediterranean Region[1]

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A comparative study of the traditional use of oregano-like herbs in the Mediterranean region provides convincing evidence that the hyssop of the Bible is the carvacrol chemotype of the plant Majorana syriaca. *The ancient tradition of ritual use of this plant gave rise to two cultures of condiments: za'atar in the Middle East and oregano in Europe.*

The flavor of the original hyssop was the determining factor in this development and remained unchanged in oregano and za'atar throughout the centuries.

Природа библейского иссопа и происхождение традиции употребления специй группы орегано в районе Средиземного моря. *Изучение душистых трав из группы орегано /душица/, традиционно употребляемых в районе Средиземноморья, представило убедительные доказательства того, что иссоп, описанный в Библии, является карвакрол-содержащим хемотипом растения* Majorana syriaca.

Древняя традиция ритуального использования иссопа легла в основу развития двух культур специй: за'атара на Ближнем Востоке и орегано в Европе.

Вкус и запах истинного иссопа явились направляющими факторами этого развития. Они сохранились идентичными и неизменными в специях за'атар и орегано на протяжнеии веков.

Oregano is one of the most popular herb condiments throughout the world. Being so well known in daily use, however, it presents a serious problem for scientists trying to establish the identity of its botanical source. Calpouzos (1954) showed that the attempt to find a sole plant source of oregano is unfeasible. Presenting a list of 39 species used throughout the world as sources of the condiment, he concluded that "the condiment name oregano should be understood to refer, not to any species but to a particular spice flavor furnished by plants of several genera in different parts of the world."

In his recent report Lawrence (1984) described the state of the art concerning the botanical identity and the chemical composition of 52 species from six families known to be sources of oregano.

It is known that the main world suppliers of dry oregano herb are Greece and Turkey. Greek oregano, which is considered to be of the highest quality, consists almost exclusively of leaves and flowering parts of *Origanum heracleoticum* auct. (Tucker 1974, 1981). (The name of this taxon was recently corrected to *O. vulgare* L. ssp. *hirtum* (Link) Ietswaart [Ietswaart 1980].) In a recent study of the taxon it was found that its population consisted of at least three chemovarieties similar in their physical appearance, but differing by their essential oil composition and,

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consequently, by their flavor. According to their oil composition and flavor profiles, these chemovarieties were defined as marjoram, thyme, and oregano types.

The two latter types, containing thymol and carvacrol respectively as their main constituents, were found to make up the overwhelming majority of the wild *O. heracleoticum* populations in Greece. It was also shown that the relative distributions of the thyme and oregano types are comparable (Fleisher and Sneer 1982).

However, in each chemical study of the essential oil of Greek oregano, carvacrol and not thymol was found to be the main oil constituent of the condiment (Ietswaart 1980; Lawrence 1984; Rhyu 1979; Stahl et al. 1969). The reason for this was that the carvacrol-containing plants were preferably harvested by the collectors, who knew what they were looking for.

Following Calpouzos' (1954) idea connecting the condiment name "oregano" with a definite flavor, Fleisher and Sneer (1982) concluded that "A high carvacrol content in the essential oil is the key to the concept of the 'oregano' spice and is a prerequisite determining a plant's suitability for the preparation of this condiment." They also concluded that the exclusive collection of carvacrol-containing plants is rooted in the traditional preference of this particular flavor for oregano condiment preparation.

HYSSOP

Searching for the source of this tradition we faced the ancient claims connecting the concept of oregano, on one hand, with the plant hyssop described in the Bible (the name hyssop, the Greek form of the Hebrew word "ezov" [Anonymous 1969; Le Stange 1978], is first mentioned in the Exodus 12:22 description of the Passover ritual) and, on the other hand, with za'atar, a condiment extremely popular in the whole Middle East and especially in the territory of the Holy Land. The claims of most importance are presented below:

(1) At the beginning of our era the hyssop was so well known that Dioscorides (40–90 A.D.), who was the founder of phytotherapy, while not describing hyssop in his *De Materia Medica,* referred to it, explaining the characteristics and the use of the plant origanon (Andrews 1961; Crowfoot and Baldensperger 1932).

(2) Rabbi Saadia Gaon (882–942), a respected Hebrew scholar, says in his commentaries on Exodus 12:22 that hyssop is called za'atar in Arabic and origanum in Latin (Saadia Gaon 1924).

(3) Maimonides (1135–1204), the famous Hebrew theologian and physician, explained the hyssop of the Law as "plainly the za'atar which the people use for their food" (Maimonides 1948).

However, not one, but a number of plants called hyssop (ezov), were known in antiquity in the Holy Land. All of them were used as food additives, but only one was considered by the Hebrews fit (kosher) for ritual purposes. The Mishnah part of the Talmud points out that for the ritual purposes "any kind of hyssop that is given an attached name is invalid: hyssop, simply so-called, is valid; Greek hyssop, stibium hyssop, Roman hyssop or desert hyssop are invalid" (Mishnah, Parah, XI, 7).

Two conclusions may be derived from the aforementioned: (1) The name hyssop was a collective name of a number of plants used for food and endowed with

some common properties; and (2) The concepts of hyssop, oregano, and za'atar are identical; thus different hyssops used in the past most probably correspond to different za'atar plants in our time.

In our work the chemical aspects of the species associated with za'atar condiments have been studied and compared to those of oregano. A fascinating similarity in the tradition of gathering and consuming za'atar and oregano and the practical identity of their flavor profiles has been found. The fact that both concepts—"za'atar" and "oregano"—have been repeatedly connected by ancient investigators to the Bible hyssop led us to believe that the traditional use of za'atar and oregano is, in fact, the transformation of the ritual use of the hyssop in Biblical times, while the flavor of the original hyssop was the connecting factor. An attempt to prove this hypothesis is presented below.

ZA'ATAR

A number of plants are presently called za'atar. The za'atar plants were and are used as a condiment in foods. Thus, our first hypothesis is that the similarity in flavor was the reason that they were given one common name.

In order to check this supposition, we reviewed the species associated with za'atar and studied their essential oils.

Like "oregano," the name "za'atar" is used to designate a universally employed condiment as well as the species used in its preparation. The following za'atar species are commonly known among Arab population in the Holy Land: *Satureja thymbra* L.—za'atar rumi or franji (Roman or European hyssop), savory; *Thymbra spicata* L.—za'atar hommar or sahrawi (donkey or desert hyssop) (Hareubeni and Hareubeni 1950); and *Coridothymus capitatus* (L.) Reichenb.—za'atar farsi (Persian hyssop), Spanish oregano (Crowfoot and Baldensperger 1932; Zaitschek and Levontin 1971).

In the Holy Land, however, for the preparation of za'atar condiment these plants are very rarely used. The za'atar par excellence, used by the overwhelming majority of the oriental communities and the only za'atar without a name attached, is *Majorana syriaca* (L.) Raf. (Crowfoot and Baldensperger 1932; Feliks 1968; Hareubeni and Hareubeni 1950).

The compositions of the essential oils that determine the flavor of the condiments are described in the literature. The oil of *Coridothymus capitatus* is known as Spanish origanum essential oil. Its composition was studied in detail by Albers (1942), Guenther (1949), Igolen (1970), Lawrence (1984), and Sendra and Cunnat (1980). It contains 5–20% p-cymene and a minor amount of thymol. Each study concluded that in the essential oil of *C. capitatus* the main constituent, carvacrol, usually amounts to about 70%. Recently, it was shown that the plant population of *C. capitatus* in Israel and West Bank of Jordan River consists of three chemovarieties differing in carvacrol:thymol ratio (Fleisher et al. 1984).

The chemical composition of *Satureja thymbra* oil resembles that of origanum oil. The aromas of both oils are similar; the expensive savory oil is sometimes adulterated with the oil of *Coridothymus capitatus*. Carvacrol is also the main component of savory oil (Albers 1942; Guenther 1949).

Thymbra spicata plants are practically not used for condiments. However, the composition of *T. spicata* oil is similar to the *Coridothymus capitatus* and *Satureja*

TABLE 1. CHEMICAL COMPOSITION OF DIFFERENT ZA'ATAR SPECIES.

Compound	Percentage composition		
	*Coridothymus capitatus** (Greece)	*Stureja thymbra* (Israel)	*Thymbra spicata* (Israel)
α-thujene	0.6	1.7	0.6
α-pinene	0.8	0.8	0.3
camphene	0.1	0.1	
β-pinene	0.1		
myrcene	1.8	2.1	0.6
α-phellandrene	trace	0.2	
α-terpinene	1.2	0.8	
limonene	0.3	0.6	
1,8-cineole	0.3		
γ-terpinene	5.3	15.9	6.6
ρ-cymene	5.5	12.4	25.6
terpinolene	0.3		
1-octen-3-ol	0.4		
linalool	0.5	0.8	
terpien-4-ol	0.7	0.4	0.3
borneol	0.2		
α-terpineol	0.1		
caryophyllene	3.0	4.1	0.4
thymol	0.4	0.9	0.2
carvacrol	73.6	55.2	63.1

* cf. Lawrence (1984).

thymbra oils and its carvacrol content also reaches 70% (Gildemeister and Hoffmann 1961). Detailed composition of the essential oils of this species is shown in Table 1.

The essential oil of *Majorana syriaca* has also been studied in the past. Guenther (1949) quoted the results of analysis of oil from *Origanum maru* L. (the previous name of *M. syriaca* [Feinbrun-Dothan 1978]) and layed stress on the sample containing about 60% thymol. Investigation of *M. syriaca* oil, carried out by Zaitschik and Levontin (1971), also showed thymol to be the main component of the oil.

If this is so, then the flavor of the main za'atar plant—*Majorana syriaca*—differs considerably from the flavor of other members of that group, and the basic assumption about the similarity of the flavors of the za'atar plants is not correct.

However, it is also possible that the chemical studies of *M. syriaca* were incomplete and that the populations of this species, as in the case of *Origanum,* could consist of a number of chemotypes and, among them, could be plants containing carvacrol as a major component.

We undertook a thorough chemical study of the essential oil from wild populations of *M. syriaca* in the Holy Land.

EXPERIMENTAL

Samples of *Majorana syriaca* plants were obtained the following way:

In every region where a developed population of *M. syriaca* plants was found, an area of approximately 0.1 ha was randomly chosen for sample collection.

TABLE 2. PHENOL CONTENT IN ESSENTIAL OILS OF *MAJORANA SYRIACA* SAMPLES FROM DIFFERENT LOCATIONS IN THE HOLY LAND.

Population	Date of sample collection	Content in percent		
		Essential oil in plant	Thymol in essential oil	Carvacrol in essential oil
Main chemotype: thymol				
Mt. Meron, Upper Galilee	10.6.79	3.8	64.9	5.0
Pqe'in, Upper Galilee	2.11.78	1.3	57.1	3.1
Kishor, Upper Galilee	2.11.78	1.1	60.6	2.1
Admit, Upper Galilee	23.12.78	0.6	46.9	1.4
Nin Village, Izreel Valley	19.9.78	2.5	70.7	11.2
Kfar Hasidim, Zevulun Valley	14.9.78	5.0	68.2	9.3
Rachasim, Zevulun Valley	15.9.78	2.4	57.4	3.0
Churshat HaArbaim, Mt. Carmel	4.11.78	1.8	42.8	3.3
Menashe Forest, Manassia Mts.	4.11.78	1.1	56.6	4.7
Sebastia, Samaria	25.1.79	1.4	61.8	5.3
Mescha Village, Samaria	14.4.79	2.1	63.5	3.4
Ramalla, Judean Mts.	25.1.79	2.5	54.0	3.8
Abu Ghosh, Judean Mts.	20.5.79	2.3	67.0	1.9
Beit Jalla, Judean Mts.	20.5.79	2.4	58.6	4.9
Main chemotype: carvacrol				
Mt. Pua, Upper Galilee	17.6.79	3.5	1.5	74.3
Kibbutz Lavy, Eastern Galilee	23.12.78	1.2	4.8	50.4
Ibten Village, Zevulun Valley	14.9.78	2.6	0.6	70.0
Yokneam, Manassia Mts.	15.2.79	1.0	17.9	60.4
Ma'ale Gilboa, Gilboa Mts.	21.1.79	0.5	4.5	64.9
Kabatia, Samaria	25.1.79	1.9	0.9	61.0
Wadi D'uk, Samaria	17.6.79	3.0	1.9	74.9
Beit-Shemesh, Judea	20.5.79	2.5	12.0	55.1

Representative samples of plant material were gathered by taking one branch of each *M. syriaca* plant growing on the plot.

Za'atar condiment samples were bought in market places in different towns and villages of Israel and West Bank of the Jordan River or were given to us by the people from their home-made stocks.

From each plant sample and condiment sample the essential oil was distilled using the commonly known Clevenger trap (Guenther 1949).

The obtained oil samples were analyzed by gas-chromatography. Packard G C, Model 7400 with a flame-ionization detector was provided with glass columns 8 × ⅛″ packed with 5% Carbowax 20 M and 5% SE-30 on CW AW 80-100 mesh.

The operating conditions were as follows:

Initial column temperature 80°C, programmed at rate of 5°C/min to 210°C. Inlet temperature 270°C, detector oven temperature 230°C, carrier gas nitrogen, flow rate 30 ml/min, hydrogen flow rate 35 ml/min, air flow rate 300 ml/min. The sample volume injected was 0.1 ml. The peaks were registered by Unicorder Model U-225 M recorder and integrated with Spectra-Physics System-1 computing integrator. Peaks were identified by comparison of their relative retention time (with camphor as standard) with that of known compounds. For the control of identification correctness, the peak enrichment method was used.

TABLE 3. PHENOL CONTENT OF ESSENTIAL OIL OF ZA'ATAR SPICE.

Source of za'atar spice	Content in percent		
	Essential oil in condiment	Thymol in essential oil	Carvacrol in essential oil
Spice type: thymol			
Nin Village, Izreel Valley	2.5	71	11
Usfyia Village, Mount Carmel	1.7	68	3
Fureidis, Mount Carmel	1.6	84	4
Nablus, Market Place, Semaria	0.6	41	19
Old City Jerusalem, Market Place	0.4	62	3
Old City Jerusalem, Market Place	0.4	48	22
Spice type: thymol and carvacrol			
Horfesh Village, Upper Galilee	1.3	44	46
Haifa, Market Place	3.2	30	49
Jenin, Market Place, Samaria	0.3	29	36
Nablus, Market Place, Samaria	0.5	34	24
Nablus, Market Place, Samaria	1.2	40	22
Old City Jerusalem, Market Place	0.7	41	36
Gasa Market Place	1.3	53	44
Spice type: carvacrol			
Gush Halav Village, upper Galilee	0.8	15	64
Horfesh Village, Upper Galilee	2.1	7	59
Jatt Village, Lower Galilee	3.3	10	65
Hilf Village, Zevulun Valley	4.4	4	76
Bosmat Tivon, Zevulun Valley	2.7	14	77
Bosmat Tivon, Zevulun Valley	2.5	8	73
Haifa, Market Place	1.0	34	55
Haifa, Market Place	1.5	17	61
Jenin, Market Place, Samaria	0.8	20	52
Jenin, Market Place, Samaria	2.3	5	70
Jalbun, Gilboa Mountains	0.5	5	65
Kabatia Village, Samaria	0.9	2	75
Tul-Karem, Market Place, Samaria	0.8	3	69
Nablus, Market Place, Samaria	1.7	7	59
Nablus, Market Place, Samaria	2.4	4	67
Old City Jerusalem, Market Place	0.2	28	54
Old City Jerusalem, Market Place	2.8	20	41
Old City Jerusalem, Market Place	0.2	18	52
Old City Jerusalem, Market Place	1.3	9	64
Arrub Village, Judea	2.1	1	77
Hebron, Market Place, Judea	2.8	2	71
Gasa, Market Place	1.6	3	66

DISCUSSION

The data obtained from our study of *M. syriaca* are summarized in Table 2.

The data in Table 2, in fact, testify to the existence of two chemotypes of *M. syriaca*. One of these chemovarieties is rich in carvacrol, but substantially less widely distributed (Fleisher et al. 1980). The flavor of the essential oils of this plant type is very similar to those of the essential oils of *Coridothymus capitatus*, *Satureja thymbra* and *Thymbra spicata*.

In the next step of our investigation, we analyzed the essential oil from home-

TABLE 4. CHEMICAL COMPOSITION OF CARVACROL-TYPE ESSENTIAL OILS OF *MAJORANA SYRIACA* AND *ORIGANUM VULGARE* SPP. *HIRTUM*.

Compound	Percentage composition	
	Majorana syriaca	*Origanum vulgare* spp. *hirtum*
α-pinene	0.5	0.3
camphene	0.1	0.2
β-pinene	0.2	
myrcene	1.1	0.8
α-phellandrene	0.2	0.1
α-terpinene	1.2	0.8
limonene	0.2	0.3
1,8-cineole	0.4	0.2
γ-terpinene	7.2	15.0
p-cymene	10.3	5.9
terpinolene	0.1	
linalool	0.3	0.4
terpinen-4-ol	0.5	0.7
β-caryophyllene	1.3	1.0
α-terpineol	0.4	0.3
borneol	1.4	1.1
thymol	0.3	0.4
carvacrol	69.5	67.3

made and commercial za'atar spices prepared from *M. syriaca*. The results are shown in Table 3.

It can be seen from the data in Table 3 that the carvacrol type of *M. syriaca* is preferred for the preparation of condiments, in spite of its narrower distribution. To verify this, the analysis of variance (F-test) (Snedecor 1946) was carried out for data in Table 3, taking into account null hypothesis of no grouping among these data. The F-test yielded that the division of condiment samples according to their carvacrol content is significant at 99% level. Consequently, the carvacrol type of *M. syriaca* is the real za'atar.

Thus, our first hypothesis is confirmed. The term za'atar, in fact, refers to different species that exhibit the similarity of their flavor characteristics.

The comparison of chemical compositions of the essential oils from carvacrol types *Majorana syriaca* and *Origanum vulgare* spp. *hirtum* is presented in Table 4.

It can be seen that the compositions of both oils are very similar. For this reason, the flavors of the condiments prepared from both species, are, in fact, identical. This, in turn, explains and supports the identity of terms "za'atar" and "oregano" stated many centuries ago.

Summarizing the above, we observed that both za'atar and oregano source plant populations consist of two chemotypes. These chemotypes have no visual distinguishing characteristics whatsoever and differ only by flavor. Based on the above, it is obvious that in countries where za'atar and oregano are traditionally used, the carvacrol-containing type of plants is evidently preferred for condiment preparation. This means that the presence of significant quantities of carvacrol is necessary for plants to be za'atar as well as oregano and is also the basis connecting both concepts.

We can now return to the Biblical hyssop.

TABLE 5. ESSENTIAL OIL CONTENT AND PHENOL COMPOSITION IN *MAJORANA SYRIACA* PLANTS IN MOUNT SINAI AREA.

Sampling site	Essential oil content %	Percentage composition	
		Thymol	Carvacrol
Wadi Tufhah	6.6	0.2	88.1
Wadi Irabah	5.7	0.2	83.3
Entrance to Wadi Rutig	7.1	4.8	72.3
Wadi Shabaiyeh	7.6	0.2	75.4
Gebel Musa (Mt. Moses, Mt. Sinai)	7.5	0.3	85.4

After centuries of apparently hopeless scientific and theological disputes, botanical and folklore research of the last decades leaves no doubt that *Majorana syriaca* is actually the hyssop of the Bible.

While referring the reader to the manifold and convincing proofs of this fact (Andrews 1961; Crowfoot and Baldensperger 1932; Feliks 1968; Hareubeni 1984; Hareubeni and Hareubeni 1950; Moldenke and Moldenke 1952), we think it necessary to point out that the Samaritans, faithful to their ancient traditions to this day, use this plant as the hyssop of their Passover ritual.

As stated at the beginning of our paper, the term hyssop had been identified with the terms za'atar and oregano. In this case it is natural to suppose that the hyssop, known long before oregano and za'atar and being their progenitor, ought to have a flavor identical to theirs.

Developing this idea, we formulate now our second hypothesis. The Biblical hyssop, originally known to the ancient Hebrews, belonged to only one species, and this plant was the carvacrol-bearing chemotype of *Majorana syriaca.*

Looking for proof of our hypothesis we referred to the Bible. After the first mention of hyssop in Exodus 12:22, a description of its use in the purification rites is given by Moses when expounding to the people the Law received by him on Mount Sinai (Leviticus 14:6). No characteristics of hyssop were given there. We may assume that the plant evidently grew on the spot and Moses could show it to the people. In other words, if our hypothesis is correct, the carvacrol type of *M. syriaca* must grow in the region of Mt. Sinai.

There are no data about the exact location of Mt. Sinai in Jewish tradition. Christian and Moslem traditions have been locating Mt. Sinai at the present Gebel Musa (Mt. Moses) in the region of the southern highlands of the Sinai peninsula.

A short expedition to this region was undertaken by us in summer 1979 and again in 1984. On the granite slopes of Mt. Moses we found a developed population of *M. syriaca.* No other species used for za'atar spice preparation were found to grow in the area. The analysis of essential oils obtained from samples of these plants proves that only the carvacrol type of *M. syriaca* that possesses a uniquely high essential oil content grows in the Mt. Sinai (Mt. Moses) region (Table 5).

The Beduin of the Jabaliah tribe, living for centuries on the highlands of Sinai around the Greek monastery of St. Katherina situated on the slopes of Mt. Moses, call this plant za'atar in Arabic, or rigany (oregano) in Greek.

So, all data obtained are in complete agreement with our hypothesis and as a result we come to the following conclusions:

Biblical hyssop is the carvacrol chemotype of the plant *Majorana syriaca.*

This plant, having a curative value, was an important part of the purification rites and was also used as a medicine and food additive. Later the ritual use was concentrated in the hands of priests well versed in the knowledge of the original hyssop identification marks. For daily use as a condiment, where flavor alone mattered, a number of plants were found having the same odor as the hyssop, such as *Coridothymus capitatus, Saturea thymbra, Thymbra spicata,* and later *Origanum vulgare* ssp. *hirtum.* This became the cause of ensuing remarks in religious literature concerning the necessity of choosing the right hyssop for ritual use, and much later the cause of learned discussions. After the destruction of the Jerusalem Temple at the beginning of our era, the ritual use of hyssop ceased, while the tradition of using hyssop as a flavoring continued to exist, giving rise to two cultures of condiments: za'atar in the east and oregano in Europe.

The populations of species used in the preparation of both condiments consist of two chemotypes of different flavors. However, the odor of the original hyssop ("ezov") was the determining factor in the development of traditional cultures of za'atar and oregano in the Mediterranean region. For this reason, the carvacrol-containing chemotypes are preferably collected for the preparation of both spices today.

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Book Review

The State of Medicinal Plants Research in Nigeria. Abayomi Sofowara (ed.). Ibadan University Press, Ibadan, Nigeria; available from Dr. James L. Edwards, Dept. of Philosophy, Nassau Community College, Garden City, NY 11530. 1986. 404 pp. $35.00 (paper).

This book represents the proceedings of a workshop held in Ife, Nigeria, in 1986, and reports efforts to identify Nigerian and other African medicinal plants that could yield drugs for local use. A wide range of subjects can be found among the 11 plenary lectures, 26 contributed papers, 2 invited foreign contributions, and 19 abstracts. Some orient the reader to social aspects of herbal medicine in Nigeria and thus set the stage for the papers on the pharmacological aspects that follow. Working groups integrate these data into four reports that outline the status of medicinal plant research and the research priorities that should be undertaken to achieve the goal of the conference. The titles of these working groups include: Traditional Medicine, Botany, Cultivation and Standardization of Medicinal Plants; Chemical Investigation of Medicinal Plants for Active Principles; Pharmacology, Toxicology, Clinical and Veterinary Applications of Medicinal Plants; and Drug Production from Medicinal Plants. Their conclusions, presented in outline form, are of value to those attempting to establish guidelines for studies integrating traditional healing practices with modern medicine. This volume also presents a reasonable overview of the status of medicinal plant research in Nigeria, and remains useful as a reference to those studying tropical plants as a source of new or interesting drugs.

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