

Case study on the preparation of a National Food Standard for Zaatar

Dr Jihad R. Noun

Roundtable on issues Related to the Establishment and
Action of National Committees on Trade and Environment
12-14 January 2010 ESCWA Beirut Lebanon

1

What is traded zaatar

- Zaatar is a traditional and very popular commodity in East Mediterranean countries
- It is traded in different levels (bulk, dried, semi-processed, processed, etc)
- It is traded in different mixes (sumac and or cumin, sesame, salt, etc.
- For different uses (Manakish, essential oil, seasoning, etc.)
- Of different plant origins

2

Why Lebanese standards on zaatar

- Lack of International, European or American standard that may serve as reference.
- Standards exist however for individual herbs (rather than mixes)
- International standards do not take into consideration the higher local consumption of zaatar
- As such, a Lebanese zaatar standard would need to have stricter norms.
- Needs for harmonization of standards in the region

3

Importance of standards for zaatar

- Important for marketing especially with the diversity of zaatar mixtures and prices
- Facilitate its national and international trade,
- Encourage high-quality production,
- Improve profitability and competitiveness of local zaatar producers
- Protect consumer interests.
- Overcome consumers misperceptions:
 - between cultivated and wild zaatar
 - between different zaatar species and mixtures in the market.

4

Standardizing procedures

Part 1: Technical procedures

5

Targeted traits in the standards

Classical standards concern mainly:

- morphological or physical traits (color, texture, size, etc),
 - to verify the absence of strange material
- chemical traits
 - to verify the composition, the dietary value, the additives, etc.
- microbiological analysis (aerobic, non aerobic, etc)
 - to verify that final products are free of contamination sources.
- toxicological analysis (heavy metals, pesticides residues, aflatoxines, etc.)
 - to detect any toxic compound or pollutant of different origins.

6

Comparison of the standards in neighboring
ESCWA countries

Country	Concerne d species	Moisture range	Total ashes	<u>Acid Insoluble ashes</u>	<u>Crude fibers</u>	<u>Protein</u>	Essential oil (ml/100g)
Lebanon	O. syriacum & Thymus vulgaris	Max 12% (10% in Syria only for Mixes)	<u>Max 10- 14%</u>	<u>Max 1- 5%</u>	Max % 12-30%	Max 9-16%	Min 1-1.8
Syria	Thymus vulgaris					NA	Traces-5
Jordan						NA	Min 1-1.8
Egypt					NA		
ISO	Origanum vulgare				NA	NA	

7

Different toxicological criteria and adopted threshold in the East
Mediterranean region of ESCWA

Country	Microbiological analysis	Heavy metals analysis	Pesticides residues	Total Aflatoxins B1, B2, G1, G2 µg/kg
Lebanon	Definition and details may vary among countries	Arsenic, Lead, Copper	According to Lebanese Standards	10
Syria		NA	According to International Standards	15 for all, and <5 for B1
Egypt		Arsenic, Lead, Mercury	According to FAO Standards	NA
Jordan	Too General (not specified)	NA	According to International Standards	According to International Standards
ISO	NA	NA	NA	NA

8

Zaatar mixes Standards for different components									
Country	Zaatar	Sesam	Sumac	Salt	Citric Acid	What we can add	What we can not	Strange material of plant origin	Strange material not of plant origin
Lebanon	Min 15%	NA	NA	NA	Allowed under good processing practices	Any of allowed additives under related standards	Artificial colorants, organic matter مواد عضوية مألوفة	NA	NA
Syria	Min 15%		Min 10 %		Max 2% (and should be mentioned clearly on the label)	Zaatar leaves, Anis, Cumin, Sumac flowers, coriander, Roasted chickpea (فصامي), Fennel, Caraway سليفه, sesame, etc. Max 20% مخصصة	Bran او ردة البرغل (نخالة), Cake كعكة, dried bread, any plant leaves other than zaatar, natural and artificial colorants	Max 2%	Max 2%
Egypt	NA	NA	NA	NA	NA	NA	natural and artificial colorants	NA	NA
Jordan	Min 40%	Min 30%	Min 4%	Max 4%	0%	Anis, Cumin, Roasted chickpea (فصامي), Fennel, Roasted wheat, Spices and seasoning (بهارات), olive oil	Bran (نخالة), Cake كعكة, dried bread, any plant leaves other than zaatar, natural and artificial aroma except those coming from Spices and seasoning	Max 7% (including strange organic matter such as stem woody parts and plant parts, sand, soil),	
ISO	NA	NA	NA	NA	NA	NA	NA	Max 3% of broken stalks and other plant parts	Max 3% for semi processed oregano ⁹

Standardizing procedures

Part 2: Process & Concept

10

Legal aspect and step by step approaches

- LIBNOR is a national organism for standards issuing in Lebanon
- LIBNOR established in 2004 a technical committee for spices and condiments,
- And a sub-committee for dried zaatar and sumac involving:
 - the Ministries of Agriculture, Industry, Economy, Trade, Public Health, etc.
 - private sector producers/traders, NGO's
 - UN agencies: UNIDO, WHO, ESCWA, etc.
 - researchers,
- Periodical meetings established a methodology and a schedule:
 - Review of other available standards in the region
 - Identification of analytical criteria for standards
 - Zaatar sampling is done (pure and mixes)
 - Analysis is done in IRI
 - Review and discussions of the results
 - Discussions and Establishment of the standards thresholds
- In November 2006, a provisionally approved draft version is issued with objections!!

11

First Standards issued pros and cons and improvement suggestions

- Distorsions regarding crucial methodology gaps (mainly sampling) and the traceability
- Tension between LIBNOR representants defended by the traders and the other members mainly universities, ESCWA and Ministry of Agriculture.
- Active debates and objections inside the committee
 - the standardization process is under review
- Recommendation:
 - further sampling and laboratory analysis to be more representative
 - Additional analysis in zaatar mixes (sumac, essential oil, etc.)
 - Focusing on the specificity of the local production for eventual establishment of geographical indication for Lebanese zaatar

12

First improvement tentatives

- Based on the recommendation, a number of laboratory tests were conducted in late 2006, during 2007 and 2008 harvests.
- The results led to an official request issued in April 2007 to modify the standard.
- A study is currently underway by researchers from Lebanese universities to elaborate the characteristics and composition of Lebanese zaatar in detail.
- Once finalized, the study is expected to constitute the basis for future modifications of the standard, which remains a work in progress.

13

ESCWA fuelled the first initiative of testing the issued standards

- ESCWA already engaged since 2005 in zaatar projects for income generation in South-Lebanon area,
- As part of efforts to strengthen the competitiveness of small producers, ESCWA began working with LIBNOR to assess the technical components of the standard:
 - analytical work is run on Lebanese cultivated zaatar in order to better assess if the production fits with the issued standards.
- Samples were collected:
 - from different cultivation sites in south Lebanon and in other areas
 - of different origin of the cultivated populations.
 - Of different seasons in order to assess the diversity and the variation in the field between the harvesting season (2-3 harvesting seasons are possible in irrigated fields).

14

Laboratory Accreditation body

- the feasibility of the different analysis was investigated in Lebanon in order to adopt the recommended laboratory for analysis.
 - Different laboratories were investigated
- Industrial Research Institute (IRI) was selected because:
 - IRI is associated with Libnor for standards approval, and
 - is equipped to run such analysis,
 - is accredited by international accreditation bodies
 - Mainly, Libnor cannot question IRI results

15

Laboratory requirements for preparation of standard

- Laboratory should be accredited
 - Accredited material
 - Are the laboratories well equipped
 - Is the staff well trained
- Testing methods should be accredited:
 - Accredited methods
 - Is there accredited testing methods for local products?
 - Is it possible to adapt imported methods
 - How to be sure about the results?

16

Main methods and equipment needed for preparation of zaatar standard			
	Equipment	Methods	Remarks
Physical analysis	microscopy, binocular, oven, pH meter, etc.	Observation	Easy needs training
Chemical analysis	Glassware, chemicals, etc.	Titrimetric methods	easy to do without high tech
Essential oil extraction	Clevenger type apparatus, (alambic)	hydro or steam distillation	Easy, needs training
Minerals: K, Na, Ca, etc.	Flame photometer	Photometry	Complicated high tech, needs advanced and expensive equipment and well trained staff
Heavy metals: Pb, Cu, As, Hg, etc.	Spectrometer, HPLC, GC and GCMS	atomic absorption, HPLC, Gaz Chromatography, and spectrophotometry	
Pesticides			
Essential oil profiles		Gaz Chromatography, and spectrophotometry	
Microbiological tests	laminar flow cabinet, Petri dishes and media	cultivation	Easy, need training

Analysis process in IRI

- The morphological analysis and the chemical analysis concerning the main compounds were done without problem and relatively without delay.
- Meanwhile the key analysis for such an aromatic plant took months to be fulfilled (essential oil extraction and profile analysis)
- Jointed efforts are deployed to overcome some analytical problems and adapt available methodologies

Do the Tests match the Standards

- Do our results fit with Lebanese standards?
- ESCWA collected 12 samples from different parts of south Lebanon and from different harvests
- Samples are taken during harvest on full blooming stage
- Samples are dried under the shade, threshed manually
- Final samples of leaves and flowers are expedited for testing
- Samples are analyzed in IRI as it is accredited for LIBNOR.
- The results are showing the following status.

19

Status of the chemical analysis

	Standards Threshold	Min	Max	No of outranged accessions	Pourcentage of outranged	Observations
Moisture range	Max 12%	9.1	13.3	3/12	25%	Factor subject to atmospheric local moisture. i.e. in Ain el Delb (coastal area) it is higher than in Debel (interior area)
Total ashes	Max 10% (12% for baladi)	7.9	11.5	3/12	25%	0% if the zaatar is considered as baladi
Acid insoluble ashes	Max 1.5%	0.1	0.9	0	0	
Crude fibers	Max 16% (12% for Baladi)	17.4	21.2	12/12	100%	All the analyzed material was outranged
Protein	Max 9% (14% for baladi)	6.1	15	8/12	66.70%	
Essential oil	Min 1%	5.2	6.5	0	0	

20

Interpretation of the results

- Regarding the chemical analysis, we conclude that over 12 samples:
- Our samples are:
 - 100% within the range only for acid insoluble ashes (free of dust, sand, gravels, soil, etc.).
 - Meanwhile they are 100% out of range for the crude fibers content
 - 66.7% out of range for the proteins.
 - 25% out of range for the moisture
 - 25% out of range for the total ashes.
- Since the results conducted under traceability procedures regarding their origin and type of cropping, we can conclude that the Lebanese standards do not fit to a Lebanese produced zaatar.
- Regarding the essential oil content, all the analyzed material was highly above the requested minimum of essential oil.

What would be the case if more samples are taken from other areas?

21

Status of the microbiological analysis

	Standard s Threshold	Min	Max	No outranged accessions	Pourcentage of outranged	Observations
Aphlatoxines	NA	NA	NA	NA	NA	Some samples are beyond the threshold mainly regarding the yeast and fungi and the aerobic microorganisms
Microorganismes aerobies totaux (30°C UFC/g)	10^6 - 10^7	1.1×10^2	1.7×10^6	2/12	16.60%	
Coliformes totaux (30°C UFC/g)	100-1000	<10	<10	0	0%	
E. coli (44°C UFC/g)	NA	NA	NA	NA	NA	
Coliformes fecaux (44°C UFC/g)	01-oct	<10	<10	0	0%	
Salmonella (37°C et 42°C/25g)	0	0	0	0	0%	
Bacteries anaerobies sulfitoréductrices (37°C UFC/g)	10-100	<10	1.0×10^1	0	0%	5/12 between the two limits
Levures et moisissures (25°C UGC/g)	10^3 - 10^4	<10	2.1×10^4	2/12	16.60%	

22

Status of the heavy metals analysis

	Standards Threshold	Min	Max	No of outranged accessions	Pourcentage of outranged	Observations
Arsenic exprime en As (mg/kg)	1	<0.1	0.1	0	0%	We can notice that, the results are below the thresholds mentioned in the Lebanese standards.
Lead exprime en Pb (mg/kg)	0.5	<0.1	0.1	0	0%	
Copper exprime en Cu (mg/kg)	10		0.6	0	0%	

23

Lessons learned

Methodology to assess the products diversity

In the case of Zaatar:

- It is a member of the Lamiaceae botanical family (insect cross pollination, gene flow among populations) is increasing the diversity.
- the diversity of the agroecosystems where zaatar is collected (wild) or cultivated (irrigated or rainfed cultivation, soil type (calcareous or clay soils), altitude, exposition, etc.)
- the season of harvesting, is adding more factors for the diversity of the final products.
- On the other hand, the final mixtures are also adding additional factors of variability due to the different additive ingredients (sumac, sesame, salt, cumin, etc.). consequently, the ingredients and ratio should be also specified.
- Only a comprehensive sampling method can assure a coverage of a high diversity range during standards elaboration.
- Traceability procedures should be fully respected when sampling and analyzing in order to make the methods reproducible.

25

Sampling procedures

- Increased variability leads to higher samples number.
- Samples should be prepared in the proper time (harvesting stage) in order to be representative of what is commercialized later.
- Samples should assess the plant and environmental fluctuating factors:
 - if the plantations are heterogeneous don't mix different varieties,
 - if soil is heterogeneous don't mix different uptakes from different soil types
 - if agronomic practices are different (watered versus rainfed, etc.) better not to mix different uptakes
 - if more than one harvest are done per year don't mix sampling from different seasons, etc.
 - If different mixes are done: don't mix mixes samples, etc.

26

Pre test samples holding

- Each sample could be prepared of several random uptakes (prelevements of no less than 50 plants for example) taken from each homogenous unit.
- Homogeneous uptakes could be mixed together and only 500-1000 grs are extracted from the mixture in order to get the sample.
- Samples should be dried under the shade in order not to affect the chemical composition of the essential oils and their profiles sensitive to sunlight and heat.

27

Conclusion

- **Standard setting**
 - The standards are done to protect the different partners rights in the marketing chain. Different priorities exist.
 - In Lebanon zaatar produced by Lebanese farmers in south Lebanon was out of range under first Lebanese standards based on commercial and imported products
 - For zaatar mixtures, standards protect authentic products, control additives quality and threshold (colorants, salt, strange material, etc.) and avoid contamination.
- **Methods:**
 - Traceability is a key factor in the approaches.
 - Sampling is as important as analysis itself
 - Periodical analysis for mixtures from different soil type, form different seasons from different varieties allow to keep final product with competitive market traits.

28

Recommendations

- The availability of standards cannot by itself provide the requested benefits unless appropriate testing and certification services are available:
- **Laboratory:**
 - Accredited laboratories (Accredited equipment and methods are needed)
 - Capacity building for staff
- **Production chain:**
 - Training of local producers is highly needed.
 - i.e. farmers smoke freely inside threshing or processing halls, etc.
 - The post harvest procedures to be done in appropriate areas
 - Raise awareness about the standard, as few zaatar producers are even aware of it.
 - Bring standards to be mandatory as the Lebanese zaatar standard remains voluntary.
 - Following improvement of the standard and efforts to harmonize the standards across different countries,
 - propose to issue standard as strict technical regulation.

29

Thank you for your attention