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## Journal of Ethnopharmacology

journal homepage: [www.elsevier.com/locate/jep](http://www.elsevier.com/locate/jep)

## Review

## An ethnobotanical perspective on traditional fermented plant foods and beverages in Eastern Europe

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## ARTICLE INFO

## Article history:

Received 11 March 2015

Received in revised form

2 May 2015

Accepted 7 May 2015

## Keywords:

Ethnobotany  
Fermented foods  
Food security  
Eastern Europe

## ABSTRACT

**Ethnopharmacological relevance:** Fermented food and beverages represent an important part of the worldwide *foodscape*, medicinal food domain and domestic strategies of health care, yet relevant traditional knowledge in Europe is poorly documented.

**Methods:** Review of primary ethnographic literature, archival sources and a few ad-hoc ethnobotanical field studies in seven selected Eastern European countries (Albania, Belarus, Bulgaria, Estonia, Hungary, Kosovo, and Poland) were conducted.

**Results:** Current or recently abandoned uses of 116 botanical taxa, belonging to 37 families in fermented food or medicinal food products were recorded. These findings demonstrate a rich bio-cultural diversity of use, and also a clear prevalence of the use of fruits of the tannin- and phenolic-rich Rosaceae species in alcoholic, lactic- and acetic acid fermented preparations. In the considered countries, fermentation still plays (or has played until recent years) a crucial role in folk cuisines and this heritage requires urgent and in-depth evaluation.

**Discussion:** Future studies should be aimed at further documenting and also bio-evaluating the ingredients and processes involved in the preparation of homemade fermented products, as this can be used to support local, community-based development efforts to foster food security, food sovereignty, and small-scale local food-based economies.

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## Contents

|                        |    |
|------------------------|----|
| 1. Introduction        | 70 |
| 2. Methods             | 71 |
| 2.1. Literature review | 72 |

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|    |  |    |    |
|----|--|----|----|
| 1  | 2.2. Field studies . . . . .   | 3  | 67 |
| 2  | 3. Results and discussion . . . . .  | 6  | 68 |
| 3  | 3.1. The plant biodiversity of fermentations . . . . .   | 6  | 69 |
| 4  | 3.2. The geography of traditional plant-based fermentations . . . . .  | 6  | 70 |
| 5  | 3.3. Wild vs. cultivated species and the prevalence of Rosaceae . . . . .  | 6  | 71 |
| 6  | 3.4. Most uncommon (and endangered) recorded preparations . . . . .  | 8  | 72 |
| 7  | 3.4.1. Gruels and sour beverages made of cereals . . . . .   | 8  | 73 |
| 8  | 3.4.2. Juniper beer . . . . .  | 8  | 74 |
| 9  | 3.4.3. Fermented tree saps . . . . .   | 9  | 75 |
| 10 | 3.4.4. Beer-like low-alcoholic fermented drinks: taar, kvas, and kali . . . . .  | 9  | 76 |
| 11 | 3.4.5. Millet beer "boza" . . . . .  | 9  | 77 |
| 12 | 3.4.6. Lacto-fermented hogweed soup . . . . .  | 9  | 78 |
| 13 | 3.4.7. Turshiena chorba . . . . .  | 9  | 79 |
| 14 | 3.4.8. Salted/fermented mushrooms . . . . .  | 10 | 80 |
| 15 | 3.4.9. Green pepper fermented with grape marc törkölyös paprika . . . . .  | 10 | 81 |
| 16 | 3.4.10. Wild apple and cornelian cherry vinegars . . . . .   | 10 | 82 |
| 17 | 3.4.11. Fruits and roots-based fermented beverages . . . . .   | 10 | 83 |
| 18 | 4. Perspectives of plant-based fermentations in modern gastronomies, public health/nutrition, and healthy food/beverage market . . . . . | 10 | 84 |
| 19 | 5. Conclusions . . . . .   | 11 | 85 |
| 20 | Acknowledgments . . . . .  | 11 | 86 |
| 21 | References . . . . .   | 11 | 87 |

## 1. Introduction

Foods and beverages arising from fermentation processes continue to represent an important part of the global *foodscape*. Indeed, the Food and Agriculture Organization (FAO) of the United Nations noted the significance of fermented products more than 15 years ago, highlighting their cultural and economic importance for local communities in developing countries (Battcock and Azam-Ali, 1998). We use the term "fermentation" here to refer to the transformative effect of microorganisms and their products (especially enzymes, alcohols, CO<sub>2</sub> and organic acids) on food as employed by humans in food preparation.

While a number of research studies and reviews have focused on indigenous fermented food in continents other than Europe (see, for example, Agbobatinkpo et al., 2011; Beuchat, 1983; Das and Deka, 2012; Garabal, 2007; LeBlanc et al., 2013; Maroyi, 2013; Masarirambi et al., 2009; McGovern et al., 2004; Singh et al., 2012; Steinkraus, 1996; Tamang and Kailasapathy, 2010; Valadez-Blanco et al., 2012; Valdez, 2012), there is still a remarkable lack of scientific documentation concerning the plant-based fermentations that have played a fundamental role in traditional European folk cuisines. The last attempt at discussing this phenomenon in Europe was completed by Maurizio (1927), almost one century ago.

Recently, some of the co-authors of this article analyzed the revival of juniper beer in Poland (Madej et al., 2014) and the resilience of wild plant-based and dairy lacto-fermented products among the Slavic Gorani of NE Albania (Quave and Pieroni, 2014). These studies have shown that fermented foods and beverages not only represent (especially up until a few decades ago) a significant part of the daily cuisine, but, most interestingly, local communities still perceive them to be a crucial part of their culture, with practices that are deeply embedded into the local environment and history. Furthermore, the availability of fermented foods contributes to food security and sovereignty, especially during the long winter periods when fresh produces are unavailable, in isolated mountainous communities of the Balkans (Quave and Pieroni, 2015).

It can be argued that the ethnobiological knowledge underpinned in the often neglected fermented food products serves as a crucial pillar for implementing food security and especially food sovereignty (Nolan and Pieroni, 2014), since they belong to local bio-cultural heritage, which has evolved through centuries of interactions between local societies and their environment (Nabhan, 2010).

In other words, the adaptive nature of the fermentation process within a given territory, which arose from centuries of human relationships with microbial niches in the environment, suggests that the processes and products of fermentation are part of a complex socio-ecological system made of living and non-living components and of their interactions (Scott and Sullivan, 2008). In this sense, they ultimately contribute to local population identities and their gastronomic "sense of place" as well (Evans et al., 2015; Redzepi, 2010).

On the other hand, fermented foods and beverages, and especially the lacto-fermented ones, have been the focus of many bio-scientific studies over the past decades. Importantly, these studies have pointed out the probiotic potential of fermented products and, in general, their remarkable role in human health and preventative medicine (Aggarwal et al., 2013; Arora et al., 2013; Borresen et al., 2012; Chorawala et al., 2011; Feyisetan et al., 2012; Franz et al., 2014; Khan, 2014; Khani et al., 2012; Lan et al., 2013; Marsh et al., 2014; Satish Kumar et al., 2013; Selhub et al., 2014; Singh and Bunker, 2014; Singh and Pracheta, 2012).

The purpose of this survey was to document traditional plant-based foods and beverages still in use or used until the recent past in seven Eastern European countries (Albania, Belarus, Bulgaria, Estonia, Hungary, Kosovo, and Poland), upon which further microbiological, nutritional, and pharmacological studies could be developed to assess their rational use. This could be useful for rural development experts, who foster projects aimed at sustaining local, endogenous, practices of domestic care. Moreover, new trajectories in both the avant-guard and the "folk" gastronomy have embraced aspects of food fermentation, particularly in terms of interesting tastes and increased perceived healthiness. The food and beverage and nutraceutical industry and the world of the sustainable gastronomy could benefit from the revival of the kinds of foods and techniques found in this paper, also beyond the communities/areas where these traditional preparations do still exist.

## 2. Methods

### 2.1. Literature review

The published ethnobotanical literature, folkloric references and gastronomic literature based on original field investigations

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