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ANALYSIS OF MARKET CURRENT STATE AND HISTORICAL ROOTS OF ICE WINE PRODUCTION

Досліджені історичні корені технології крижаного вина, а також проведено огляд перших фундаментів виробництва ексклюзивної лінійки. Виявлені найбільші центри виробництва вина преміум сегменту на сучасному ринку. Встановлено зв'язок між кліматичними умовами і рівнем виробництва крижаного вина поміж країнами. Наведено різницю маркування десертного вина у кожній країні.

Ключові слова: крижане вино, історичні корені, ринок, комерційне виробництво, преміум сегмент.

1. Introduction

Nowadays the world wine market is oversupplied thereby the interest is growing in atypical wine styles differing from another by the own originality of sensory, physical and chemical characteristics. Ice wine is a wine of over-ripe grapes harvested during the first frost, carefully selected and pressed by hand. Ice wine is a rare, exclusive and premium wine with the inimitable taste of honey and a high concentration of sugar [1]. Ice wine is sufficiently new wine style, technology of that was found recently, but has own positions to becoming one of the modern brand within world wine market. Such fact proves the actuality of current study completely. There are a little data about gradual development of ice wine and its historical roots in every producing-country in order to observe the rates and volumes of introduction into range that influence significantly on macroeconomic indicators including demand and supply. The further level of technology impacting in its turn on quality of products depends on former sources of production.

Entrepreneurs in the wine business are urged to adapt to changes in customer behavior and to react to trends that they perceive to be important, resulting in diverse innovation ideas and change activities. Thus, data of some wine types are not shown in full, consequently, the roots of origin are keys to understand the features of certain

technology. It is the lineage to determine the further development of wine technology.

It is the climate contributed to the emergence of special dessert wine called ice wine. Canada is considered the biggest area of ice wine due to favorable low temperatures in the winter having own scientific center indentified Cool Climate Oenology and Viticulture Institute (CCOVI) expressing the production volumes and wine composition in provinces.

2. Object of research and its technological audit

The object of research is ice wine historical roots, also current producers and areas of development of this wine type.

Difficulty of determining characteristics and entire volumes of wine selling was based on occurrence of such producers who had made ice wine once and additionally major countries have limited number of premium rare wine.

3. The aim and objectives of the research

The aim of research is to represent a complete picture of ice wine history in producing countries and its scopes in wine business, have shown concrete producers that release wine of premium segment.

To achieve this aim it is necessary to perform the following tasks:

1. Analyze the ice wine development in the world from beginning until today.
2. Systematize data obtained for representation of full-value ice wine market.

4. Literature review

Ice wine history has been started in Germany but there is the general information about German *Eiswein* in the literature [2–5]. Winemakers from wine region Franconia of Germany became first who implemented non-classical processing of frozen grapes [6], using ingenious cultivar. Riesling is the most utilised variety for production of kosher wine [7–9], which leaves on the vine during frosts.

To our knowledge, these are only studies devoted to ice wine beginnings in Canada; ice wine composition is also described by authors from this country [10–15].

Aforementioned state is the leader of ice wine outputs in the world that are mainly in its domestic market. Also ice wine production actively develops in the United States [16–25], but there is none articles highlighting fully about historical origins and characteristics of this wine produced in other countries, which had added ice wine to their profiles. The short surveys are shown by European producers [26–39], which had example of ice wine production from Germany. High education institutions also contributed to the development of high-quality wines, producing own-brand rare alcoholic beverages [40–43].

The number of articles, investigations and research works are dedicated to ascertaining of convenient yeast strains in order to provide fermentation. Despite the increasing number of producers of high quality beverages a little research is known described products of category investigated from different countries.

5. Materials and methods of research

The information base of research was the works of the foreign scientists exactly had been published in short articles in web sites. Also, official sites of companies and wineries investigated, a qualitative survey of vineyards were roots for assaying. The final summarize of the ice wine producers, winemaking and winegrowing enterprises (hereinafter jointly referred to as winemaking enterprises) were selected on the basis of the entirety of all data and information necessary for analysis. All figures were produced using Excel software (Microsoft Corp., Seattle, WA).

6. Research results

Dates of ice wine occurrence production in the world are represented in chronological order in Fig. 1.

German wine is produced in the west of Germany, along the river Rhine and its tributaries. Two thirds of Germany's wine production is white wine. The German wine regions are some of the most northerly in the world. The main wine-producing climate lies below the 50th parallel, which runs through the regions Rheingau and Mosel. The first ice wine (*Eiswein*) is believed to have been made in Franconia, Germany in the late 1700s. Although there is some debate as to where ice wine originated, many believe it was accidentally discovered in Franconia in 1774 [2].

However, it was not until the middle of the last century that Germany's wine producers made a conscious effort to produce ice wine on consistent bases. Some believes the production method for these wines was accidentally «discovered» in 1794 in Franconia, the famous region located in the central-southern part of Germany. It seems in 1794, in the city of Würzburg occurred an unexpected frost which caused the freezing of grapes [3]. Commonly known fact in 1829 caused by snap freeze the grapes had not been gathered and then left as food for animals and birds [4].

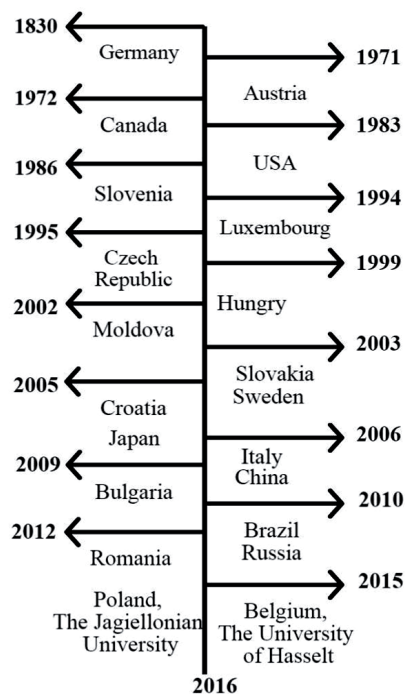


Fig. 1. Dates of ice wine occurrence production in the world

The complete production of German *Eiswein* associated with investigates of Dr. Hans Georg Ambrosi, the man is called the «father of Eiswein». According to information, Hans Georg Ambrosi had began his experiments about Eiswein in 1955, when he studied in South Africa and then established a winery in Rheingau, therefore starting the production of *Eiswein*. Dr. Ambrosi designated low-lying parts in the vineyard, created a system of draping plastic nets over the grapes in tunnel-form to protect it from animal scavengers and heavy rains [5]. In 1961 was made a number of German ice wine, and in subsequent years the popularity of wine has increased.

Currently nine of the 13 German wine regions are composed of ice producers the greatest number of which is located inside Rheinhessen where essentially the winter grape processing rises. Rheinhessen is Germany's largest wine-growing region, the total vineyard area of 26,444 hectares here [6]. About two-thirds of the area is given over to light grapes. Riesling from the banks of the Rhine and the surrounding hills is famous all over the world and the grape king for ice wine production. But Rheingau is Riesling region: this is the grape ripens on 78,5 % of the territory [7] thereby most of the ice wine producers chose precisely this area. Baden, Mosel and Pfalz make relatively identical amount of ice wine. 80 percent of the vineyards in Württemberg occupy dark grape varieties

where from the most noble sort Lemberger (*Vitis vinifera* «Blaufränkisch») of it are frozen while still on the vine. Nahe, Saale-Unstrut and Hessische Bergstraße are the smallest *Eiswein* regions.

As the German Wine Institute (DWI) announced, on the 18 and 19 January 2016 many estates in almost all German wine growing regions were able to harvest grapes. In addition, the last *Eiswein* crop was 4 years ago, that is explained by climate changes [8]. But opposite data was determined according to report of producer from Pfalz. Winery headed by Hubert Schreiber harvested Silvaner for production of *Eiswein* in late December of 2014. According to independent review written by Jean Fish and David Rayer only a handful of Mosel Estates produced *Eiswein* in 2015 among them are Dr. Hermann, Winery Karl Erbes, Winery Bauer and Winery Erben von Beulwitz. Also complication in calculating wine companies consisted in existence of producers which had obtained ice wine only one time. Such enterprises as Kessler-Zink and Karlsruhle from Phalz had produced elite wine once. The wineries including Dr. Loosen (Mosel), Anselmann (Phalz), Ernst Bretz (Rheinhessen) and Schreiber (Phalz) can be considered as the significant sellers of ice wine from Germany. Indeed, in the German wine business with global competition, small business size, costly and capital intensive expansion opportunities, cost leadership as a generic strategy can at best be chosen by a few players in the industry [9].

Despite Germany is considered the homeland of *Eiswein*, climate conditions do not allow its production every year. In a short time the main producer in the world for this type of wine became Canada where winemakers can obtain the frozen crop. But should be noted that Canadian ice wine history was begun by German emigrant especially Walter Hainle. The first ice wine was a Riesling, made in British Columbia by Walter Hainle in 1973 [10]. But exactly his son Tilman Hainle and his wife Sandra realized the first Canadian commercial product thus continued at their Hainle Vineyards in the Okanagan.

Currently, the Niagara Peninsula region, Ontario is suggested the top producer internationally. The major of wineries are located between the Great Lakes of Ontario and Erie micro-climate of that exhibit conditions are conducive to the growing the late harvest varieties. The wine industry in Canada only through the introduction of ice wine began to increase at a remarkable pace switching to wine quality grapes. Although 40 years ago, Canadian wine business was based on beverages produced from native grapes such as Niagara, Duchess and Catawba [11]. Those wines are known as having foxy descriptions of sensory. Planted acres of late harvest varieties occupy the territories, including Ontario, British Columbia, Quebec and Nova Scotia, which generally present the whole Canadian wine sphere. Due to low winter temperatures Canada is a leader in production and in regulating brand of ice wine in the world. Also should be pointed out, without a marketing strategy and management tools Canadian ice wine could not achieve success in the market.

Despite Canadian winemakers who try to obtain ice wine with 9–12 % alcohol [12], elite wines from the Federal Republic of Germany contain lower level of ethanol typically 7–9 %. This fact can be explained by timing harvest contributed largely on concentrating of grapes that in Europe is minus 7 °C. Contrary to this, wineries from Canada must harvest the grapes, when the minimum temperature is –8 °C.

Possessing a strong influence in the European Union towards political, economic and social spheres, Germany also largely controls the trends in the wine industry. After their success in the production of ice wine, other countries followed the example. According to most the second country that began to freeze on the vine grapes is Canada, but this step was taken by Austria, that is not surprising in terms of the similarity of climate and geographical location of European neighboring states. Since 1971 the country continued the kosher wine tradition in Burgenland on base of Hafner Family Estates. Julius Hafner II produced the first Austrian ice wine on a larger scale and created a portfolio of different BA and TBA wines of the highest quality standard with a long shelf-life [13]. The Austrians like the Germans, first time had used the Riesling, gradually moved on their own resistant varieties of grapes. Thus, today, a large volume of a special type of wine are produced from Grüner Veltliner and Silvaner, the growing center of which is Burgundy [14] that is the major supplier of ice wines from Austria, but considerably loses the neighboring country towards the scope and variety in the category. The total number of producers engaged in the ice business also has a lower value versus Germany. Grüner Veltliner is autochthonous Austrian grape had been frozen at first in The Small Carpathian in 2002 and Slovakian ice wine was obtained next year [15].

Ice wine production is developed in seven states in the United States that makes it the third country in the world by dessert wine volume. Ice wine has a long history in Germany and is big in Canada, but it remains a small niche in the multibillion-dollar U.S., confined mostly to upstate New York, Ohio and Michigan. Also the ice wines are made by states Washington, Oregon and Idaho that comprise into wine region West Coast can compete with aforementioned ones. But it is New York produces the greatest ice wine amount among all states today (Fig. 2).

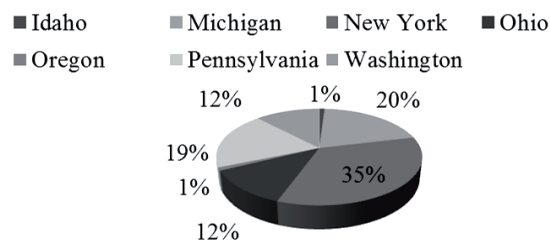


Fig. 2. Percentage of ice wine producers in USA

The interesting fact exists between designations of premium wine producing in countries located in North America. The United States indicates sweet wine by term «ice wine» whereas Canada uses «Icewine» for its product label. The wine titles on bottles in Europe are marked according to translation of native language: Germany, Austria – *Eiswein*, The Czech Republic – *Ledové víno*, Hungary – *Jégborért*, Slovenia – *Ledeno vino*, Slovakia – *ľadové ino*, Croatia – *Ledene berbe*, Russia – *ледяное вино*. Luxembourg labeled *Givre* for the differences and identification of its own product. China, Bulgaria and Japan mark their beverages as *Icewine*.

According to source [16], the first USA ice wine producer was Hunt Country in Branchport nearby Keuka Lake in New York. Hunt has been making ice wine since 1987, annually reserving a few rows of grapes among his

65 acres under production using the Vidal blanc, a tough-skinned grape that hangs in loose bunches. But it should be pointed out in 1981 the first ice wine experiment was conducted by the Great Western Winery in upstate New York's Finger Lakes region [17]. In 1988 Hunt Country released the 1987 vintage of Vidal Blanc Ice Wine, the first genuine Ice Wine produced in the United States and available to the general public. In addition, The Finger Lakes is considered the largest ice wine region in USA. The majority of wineries are located on a relatively narrow strip of land near each lake. Such layout allows obtaining ice wine harvest every year due to cool climate conditions [18].

But anyway Ice wine was first produced in Michigan in 1983 by Mark Johnson. He had studied the winemaking in Germany at the Federal Research Station and Institute in Geisenheim, then worked at Chateau Grand Traverse and is currently the head winemaker at Chateau Chantal located on the Old Mission Peninsula [19]. Nowadays the state is the third largest ice wine producer in North America after Ontario and New York due to the cool-climate vinifera varieties [20]. In 2002, for example, six Michigan wineries produced over 13,000 half-bottles of ice wine, a record at that time [21]. Ohio is also the home of making ice wine. Valley Vineyards was first in Ohio to produce rare sweet wine [22]. Most of the viticulture land in Ohio lies along the edges of the lake, where the temperatures are moderated by the insulating capacities of the water. By the same token, such distribution is suitable for cultivation of grapes widespread for ice wine making especially in Grand River Valley. Mazza Vineyards is biggest and the first Pennsylvania winery to make ice wine that belongs to Lake Erie Country in the north west of state [23]. Suitable climatic conditions of the states allow producing a wide variety of wine-making grapes, thus, the ice wine volumes are increasing every year.

Also the premium wine is made in all four regions of the Pacific Northwest basically in Washington and Idaho, with the finest traditionally coming from British Columbia's Okanagan Valley. The US state as Idaho, parts of Montana, northern California and southeastern Alaska represent other definitions of the Pacific Northwest region. Sometimes the Pacific Northwest is defined as being the Northwestern United States, wholly in the United States [24]. Chateau Ste. Michelle in Washington State is oldest winery that possible the first started to produce ice wine in northwest region of United States. This is evidenced by data of the winter of 2008 is just the sixth time in the winery's history, that it produced an ice wine [25]. The first Semillon Ice Wine in 2002 is one of only a handful ever produced in Washington State.

To finish the ice wine roots in United States should be noted, the ice wine production has become the important part of American agriculture development of which had not been increased without winemaker's experience from Germany. Thus ice wine father-country had contributed to wine industry for one of the biggest state in the world expanded own significance.

After expanse of exclusive wines in North America, European countries started switching towards to premium wine business. Being the smallest country of the Europe territory, Luxembourg has a few producers of rare wine type on the banks of the Moselle River. In December 1994, Caves Krier Frères began a new chapter in the history of Luxembourg viticulture [26] by harvesting the first

Riesling is grown in the valleys of the Mosel, where the wineries that include ice wine to profiles are located. The Institut Viti-Vinicole involved in the development issues reported that last harvest had been started in December 2015 [27].

Another smallest country Slovenia, the first started to realize the ice wines among the parts of former Yugoslavia and Soviet Union. Stanko Čurin is one of the biggest persons developing the wine sector in Slovenia [28]. With top quality and special wines, he started working more than 30 years. Especially his Winery Čurin – Prapotnik located in wine region Podravje produced the first dessert lots in 1985 [29], 9 years earlier than the above-mentioned country. But especially Posavje occupied the southeast part of the country is the main area where the biggest ice wine outputs are noticed. Winery Klet Zorenč – Hohnjec sells premium wines contained more than 14 % alcohol that represents the highly alcoholic ice wine among another samples from different countries. Also enterprise *Moravčikova vína* from the Czech Republic generates ice wine contain 14 % alcohol.

Despite the fact that the first post Soviet country which began to introduce the premium segment was Slovenia, today after Germany leading is the Czech Republic with regard to the production volume of dessert wines. The highest concentration of wine companies is located on South Moravia, which is considered the largest wine region [30], divided into Znojmo, Mikulov, the Slovak sub regions and Velké Pavlovice, where in 1995 winemakers from *Škrobák Winery* started to use ice wine technology. In addition, winery produced the first red ice wine in the country in 1999. Enterprises produce Czech ice wine is found in all listed areas. One winery from The Litoměřice Sub-region regarding to Bohemia also comprises *ledové ino* to its own range. *Znovin Znojmo* winery is the largest ice wine producer in country awarded by prestigious golden Decanter medals. Moreover, the premium segment is represented not only the wine produced in the winter season, and a straw wine has become the hallmark of state.

In another country that was included to integral Yugoslavia, Croatia the beginning of story of ice wine is also associated with efforts of winemaker named Boris Drenski, owner of Bodren winery [31]. Company specializes in production of dessert wines, from late harvest to ice wine thus providing power significance of own position inside world ice category. The premier bottle of premium wine was represented in 2005 [32]. It should be also mentioned that winegrowing region (Pregrada, Hrvatsko Zagorje) has unique microclimate conditions that provide desirable acidity in wine, the one which is so hard to accomplish in sweet wines. Simultaneously with Croatia Furano Winery located in region of Central Hokkaido, Japan also initiated to make ice wine. Wine is produced only red in limited batches and sold only at the local shops. Furano Winery is only-begotten Japanese company that interests in ice wine generation.

Last year of the 20th century was also significant for Hungarian wine industry. Wine region Tokaj had originated not only one of the world's top sweet wines, Tokaj Aszú and became famous due to producing native ice wine. Chateau Pajzos became the first winery to produce a Tokaj ice wine that was yielded not from Riesling and from indigenous variety called Furmint [33]. Generally, in Hungary there are few regions, where the weather is suitable

for the ice wine technology such as Tokaj, Eger, Villány, Balatonfüred-Csopak and Mátra. Each of aforementioned fields has one provider that harvest frozen grapes.

Ice wine has produced in Moldova since 2002. «Dionysos-Mereni» was the first company that started experimenting with ice wine in the Republic of Moldova. Wine region Codru is the central area consisted of premium wine estates such as «Chateau Vartely», «Lion-Gri», Purcari Winery [34]. Also there are ice wines inside market offered by Tiraspol Winery & Distillery KVINT. The production of ice wine was acceded by Sweden at that time. Country possesses the coldest conditions influenced on developing atypical technology but such the situation does not allow the annual grape harvest. Blaxsta Winery produces desert wines from a variety of fruit — apples, raspberries and pears and a plum port. But his prize winner is the 2003 Vidal Ice Wine, which grabbed a silver medal for sweet wine at this year's Challengedevin competition in Bordeaux, France [35].

Chiomonte is called «Saint Sebastian» conducted the first Italian ice wine testing in January 20 of 2006 that coinciding with the patron saint festivities of the city of Chiomonte, exactly San Sebastiano. The autochthonous grape Avanà was used for production by winemakers in Susa Valley belonged to the Mountain Community. With helping Donna Sommelier Europe, Italian wine association, exclusive wine type was obtained having enriched range of wines of Piedmont [36]. Also, the northwest wine region Valle d'Aosta has only one winery however continental climate can provide bigger ice wine volumes. As well as Czech Republic Italian winemakers ferment wine to high level of alcohol containing 12,5–13 % ethanol. Furthermore, in 1965, two Sicilians, Gary Pillitteri and Lena Agro, immigrated from Raccalmuto with their three children [37], owners of the largest ice wine company Pillitteri Estate Winery.

In the same year the Chinese company began to produce own kosher wines. Company Chang Yu Pioneer is the oldest and largest in China and the ten largest in the world. Every year produces more than 90,000 tons of wine. However, premium wines became involved relatively recently. In 2002 they founded a professional Château via due to France, and in 2006 by dint of Canadians founded the largest ice wine center in China. Ice wine is produced around Lake Huanlon in Liaoning Province in northeast. This place is called the «golden valley of ice wine», the total area of 5000 hectares. Chang Yu planted 340 hectares of Vidal grapes, the most common in Canada.

Bulgarian company Villa Vinifera [38] sell ice wines in very limited quantities having produced firstly in 2009. Despite of it had been made from domestic red Mavrud, but white wine was got. One more interesting fact and also strange the year is not indicated on the front of the label. Neighboring country, Romania created the first amount of premium style using Traminer grapes in 2012 [39]. Winemakers from Jidvei Company located in the Târnava wine country had harvested grapes due to favorable conditions for the production of much more fresh and refreshing white wines than in other areas of state.

It would not have been strange ice wine was derived in country where the weather usually has the high temperatures. According to information [40], popular London magazine about winemaking in the world, The Perico Winery harvested Cabernet Sauvignon grapes for the rare wine in

Brazil. In June 2010 in the coastal state Santa Catarina the temperature dropped to $-7,5$ °C making possible to execute such wine and it shows exactly low conditions are important. In the same period another continent the East Europe began to implement ice wine to their profiles. Thus, the Russian company «Phanagoria» from Krasnodar region using three varieties for ice wine — Riesling, Muscat, Sauvignon started production [41]. In 2011, range was added by another novelty — a unique red ice wine from grapes Saperavi. The grapes for this wine are grown on own vineyards of winery.

Ice wine production has been involved not only by enterprises to expand its product range and the higher education institutions in order to obtain new data from beverage processes. Experiments were carried out by employees of the vineyard «Nad Dworskim Potokiem» of the Jagiellonian University in Lazy wheel (Łazach koło) near Bochnia [42]. In addition, vineyard «Nad Dworski Potokiem» was established in 2005 on the Agricultural Experiment Station of the Jagiellonian University in Lazy near Bochnia initiative of the rector professor Karol Musiol and his inspiration came from the vineyards owned by leading European universities. First Poland Kosher wine was produced in only 20 liters in 2012 and was given to rector at the ceremony of the Jagiellonian University, including the celebration of the 650th anniversary of its founding. It should be pointed out, now the farm «Nad Dworski Potokiem» area occupies over 3,3 hectares, 11 thousand vines are grown. Due to changes in the excise tax rules, it can legally produce beverages and sell it in own store. The result of the working of vineyard white and dry red wine including Seyval Blanc, Bianca, Aurora, Hibernial are made called «Novum», referring to the main building of the Jagiellonian University — Collegium Novum.

Last year Ghislain Houben, professor of entrepreneurship at the University of Hasselt and winegrower, aimed to develop a knowledge center about ice wine in Belgium. Under his leadership the experiments were conducted for the production of ice wine from frozen apples.

In conformity with information [43] Eiswein, in France, was a style introduced by the Germans to the region, like to Canada. The segment is now shrinking in production and importance. They use only the local «Noble» varieties to produce this style of wines particularly in Alsace. However, evidence and common data of French producers are not founded and are not lighten in current study.

All countries producing ice wine by traditional method naturally from grapes that frozen while still on the vine are shown in Fig. 3.

The map represents only that states production of which is commercial and ice wine category includes more than 2 estates. Development of ice technology in Asia continent is significantly lower in comparison with Europe and North America. Three leaders are Canada, Germany and United States of America which together conduct approximately 76 % of total premium ice wine amounts. Only due to the climatic conditions of above-mentioned countries frozen crops are obtained. In addition, experience of winemakers plays an important role in the non-classical winter technology. Percentage ratio between countries produced ice wine is highlighted in Fig. 4 according to it Germany, the Czech Republic and Austria are the top lands of premium drinks in Europe. Pointedly, popularization of ice wine implement is increasing annually inside producing vine growing states.

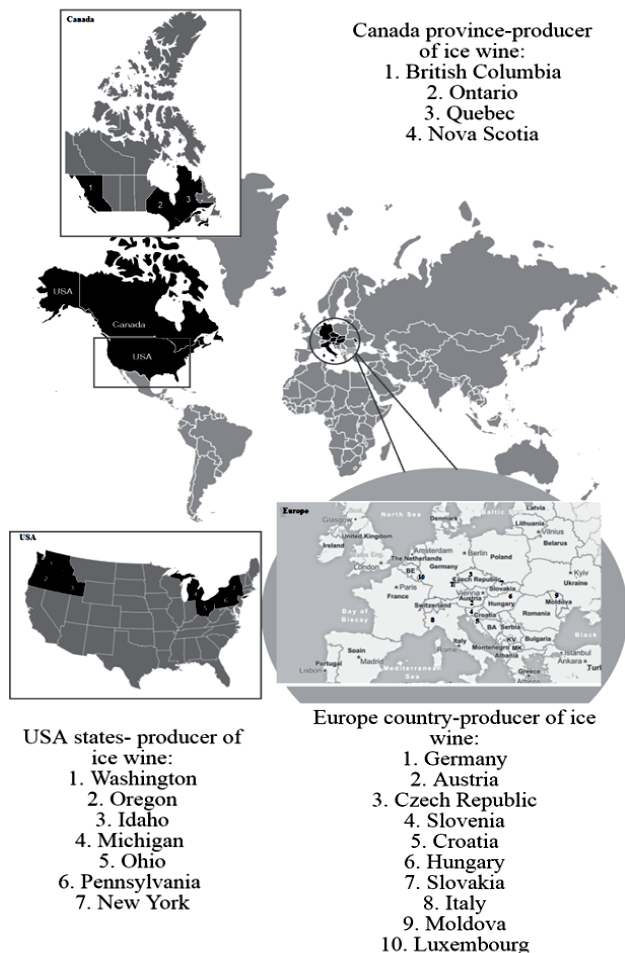


Fig. 3. Countries producing ice wine commercially

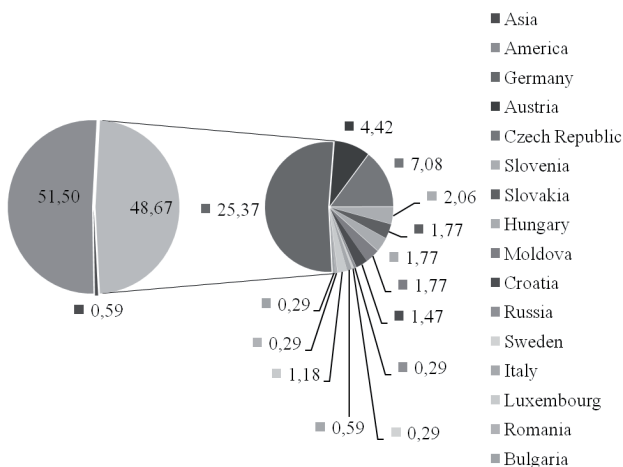


Fig. 4. Percentage ratio between countries produced ice wine

This is evident from the fact that almost 32 % viticulture segments worldwide represent premium sectors through ice wine. As ice wine is made in very small amount almost in producing countries, ice wine is not included in statistic list of annual harvest.

7. SWOT-analysis of research results

Strengths. This study for the first time compromises all producers that obtain frozen grapes by natural way to the

release of ice wines. The analyzed data showed the percentage ratio between the producing countries, in accordance with which the rare wines production of countries of the «New World» is more developed, despite of their smaller number in the category that indicates the rapid extension of innovative technology for the processing of grapes. Knowledge of these premium wines production centers allows for the potential customer to choose a high quality product and expand the horizons of the premium segment of the market.

Weaknesses. The European countries lag in the production of ice wine towards to volume and the number of producers that affect capture of the wine market by North America.

Opportunities. Overview gives a perspective study and comparison of wines of this sector by the chemical composition of different producers and countries, and to identify factors that significantly impact on the release of ice wines all over the world. Atypical grape processing technology is not fully explored, and requires further explanations regarding agricultural techniques of grapes for ice wine and the production itself.

Threats. Producers and agronomists may face the problem the adverse agro-climatic conditions for grape cultivation, which is intended for the production of ice wine. That is the risk of losses for businesses and the risk of failure for further research. This issue should be addressed at the level of collective solutions.

8. Conclusions

1. First producing sources of ice wine technology were identified around the world. The roots and development of rare wine originated from Germany that contributed to its distribution especially in European countries were described and examined. Winemakers from *Deutschland* had brought the experience of frozen technology to Canadian viticulture industry is predominant leader in ice wine volumes. In addition, the most chosen grape variety for ice wine production is originated in the Rhine region.

2. The ice wine market, starting with the first manufacturers till today was described. Such countries as France, Spain, Chile, Switzerland and Denmark are not determined as ice wine producers in current study due to neither report; however, several sources include its profiles to ice wine category.

It was observed climate conditions, experience of winemakers and emergence of grape varieties are the main keys for developing ice winemaking. Furthermore, our article describes only first producers that obtained ice wine from naturally grapes that have been frozen while still on the vine.

In order to more fully explore the principal particular qualities of premium wines from different states the further studies need include the available information from ice wine producers.

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АНАЛИЗ СОВРЕМЕННОГО СОСТОЯНИЯ И ИСТОРИЧЕСКИХ КОРНЕЙ ЛЕДЯНОГО ВИНА

Исследованы исторические корни технологии ледяного вина, а также проведен обзор первых фундаментов производства эксклюзивной линейки. Обнаружены наиболее крупные центры производства вина премиум сегмента на современном рынке. Установлена связь между климатическими условиями и уровнем производства ледяного вина между странами. Приведены различия маркировки десертного вина в каждой стране.

Ключевые слова: ледяное вино, исторические корни, рынок, коммерческое производство, премиум сегмент.

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РОЗРОБКА КОМПЛЕКСНОГО ПІДКИСЛЮВАЧА ДЛЯ ЕМУЛЬСІЙНОЇ ПРОДУКЦІЇ ОЗДОРОВЧОГО ПРИЗНАЧЕННЯ

Досліджено склад комплексного підкислювача у рецептурі низькокалорійного соусу. Визначена залежність смакових якостей продукту від концентрації складових комплексного підкислювача. Встановлено концентрації кислот в складі підкислювача (оцтова — 0,2–0,4 %, яблучна — 1,0 %, цитринова — 2,0 %), що забезпечують оптимальні показники смакових якостей продукту. Визначено, що зміни рН продукту та концентрація оцтової кислоти обернено пропорційні.

Ключові слова: харчові добавки, біологічна цінність, низькокалорійний соус, яблучна кислота, комплексний підкислювач.

1. Вступ

Сучасні тенденції розширення асортименту продуктів харчування орієнтовані на створення збалансованої за харчовою цінністю продукції, що здатні забезпечити потребу в незамінних нутрієнтах. Значна роль відводиться емульсійним олієжировим продуктам — майонезним соусам, топінгам, дресінгам — як продуктам масового споживання, що доступні усім групам населення та кожен день присутні у раціоні харчування. Це пов'язане, в першу чергу, з можливістю створення широкого асортименту комбінованих продуктів на основі компонентів природного походження, що дозволяє отримувати харчові композиції заданого складу і властивостей, із збалансованим вмістом необхідних нутрієнтів.

Результати досліджень структури споживання харчових продуктів різними групами населення України вказує на відхилення від сучасних принципів здорового харчування [1]. Це пов'язано з тим, що рафінована їжа займає практично весь раціон людини, а вживання продуктів, багатих на клітковину, мінерали, органічні кислоти тощо, зведено до мінімуму. Тому введення у рецептуру майонезів та майонезних соусів рослинної сировини та використання у якості харчових добавок натуральних інгредієнтів може збагатити щоденний раціон на біологічно активні речовини.

У зв'язку з цим, актуальними є дослідження, що присвячені пошуку удосконалення рецептури емульсійних продуктів оздоровчого призначення, здатних покрити потреби людини у необхідних нутрієнтах. При розробці відповідних технологічних рішень необхідно враховувати особливості органолептичних показників розробленої продукції відносно нормативних показників.

2. Об'єкт дослідження та його технологічний аудит

Об'єктом даного дослідження є процес розробки рецептури низькокалорійного соусу на основі вторинних продуктів сокового виробництва та виноробства.

Предмети дослідження — смакові якості емульсії вищезазначеного продукту, органічні кислоти у якості підкислювачів. Було обрано три органічні кислоти, що застосовуються у харчовій промисловості: оцтова кислота, цитринова кислота та яблучна кислота. Одним із проблемних питань при створенні майонезної продукції є створення оптимального рівня рН та органолептичних показників (зокрема смакових якостей). Проведення технологічного аудиту має за мету визначення таких основних задач:

— розширення асортименту емульсійної продукції (складові комплексного підкислювача створюють