

HOP SURVEY OF SLOVENE BREWERIES

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Abstract

This hop survey was performed to strengthen communication between Slovene brewers and hop growers within Slovenia and worldwide. Amongst the test group (17 of 62 breweries in operation throughout 2016), 49 different varieties of hops were used. The number of hops used by each brewery ranged from one variety (Savinjski Golding) to 27 varieties. Brewery hopping rates ranged from 0.25 kg/hl to 2.71 kg/hl. Of 17 breweries, six cited shortfalls for specific varieties in 2016, all of which were imports. Only two breweries cited hop surpluses for 2016 and both were able to include those surpluses into 2017 production. The findings of this survey seek to incorporate and advance the past analyses of Slovene craft breweries.

Key words: hop use, hop balance, craft breweries, questionnaire survey, Slovenia

ANALIZA UPORABE HMELJA V SLOVENSКИH PIVOVARNAH

Izveleček

Raziskava o uporabi hmelja je namenjena krepitvi poslovnega sodelovanja med pivovarji in hmeljarji - v Sloveniji in globalno. Vzorec analize je obsegal konec leta 2016 17 od 62 aktivnih malih pivovarn, ki so uporabljale 49 različnih sort hmelja. Razpon uporabe števila sort hmelja v pivovarnah sega od 1 sorte (Savinjski Golding) do skupno 27 sort. Količina uporabljenega hmelja je znašala od 0,25 kg/hl do 2,71 kg/hl. 6 od 17 pivovarn je v 2016 uvozilo manjkajoče sorte hmelja. Le dve pivovarni sta poročali o presežkih hmelja, ki pa sta jih vključili v proizvodnjo 2017. Rezultati raziskave dopolnjujejo pretekla spoznanja sektorske analize malih pivovarn.

Ključne besede: uporaba hmelja, bilanca hmelja, male pivovarne, anketna raziskava, Slovenija

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1 INTRODUCTION

Slovenia accounts for a sizeable and unique contribution to the global hop industry, with total acreage representing 3% of the world's supply. From 2002 to 2012, Slovenia's acreage decreased 36%. Since 2014, however, the total cultivated area has increased due to global brewing industry demands. In 2016, Slovenia's hop industry was comprised of 112 farms growing a total of 1,484 ha (3,667.04 ac) of hops. Slovenia's traditional hops are largely aroma varieties (IHPS, 2017). Alpha varieties and new aroma, "flavor" varieties are being grown to a lesser extent, though flavor variety acreage is rising incrementally while alpha is decreasing (IHGC, 2017). Historically, Slovenia's industry is reliant on global demand, as about 95% of the harvested hops are exported, predominantly to EU countries (80%). Furthermore, Slovenia is also experiencing rapid growth within the brewing sector. According to the Association of Slovene Breweries, there were 62 breweries producing in the country by the end of 2016 (Združenje Pivovarn Slovenije, 2017). This is an 11.29% increase from 55 breweries in 2015 and, as of October 2017, there are already about 90 breweries, which indicates a 63.64% increase in number of breweries over just two years time (Brewers of Europe, 2016; PivoMan, 2017). This does not include the unknown number of unregistered breweries.

The objective of this survey is to strengthen communication between Slovene brewers and hop growers, both within Slovenia and worldwide (Pavlovič, 2014). Historically, hop sourcing was standardized based on the general uniformity of hop market offering (ie. varieties, annual production, etc.) and brewery type (ie. size, dosage standards, class of brewery, etc.). As the market shifts towards an increasingly diverse brewing industry, hop growers must understand and negotiate the sourcing practices needed to meet transitioning demands.

The first version of this survey was issued by the Brewers Association of USA (BA) in 2008, following hop shortages in 2007 - 2008. As the not for profit trade group dedicated to supporting American craft brewers, their intent was to encourage member breweries to develop stronger relationships with their hop merchants and hop growers. Survey findings are presented to suppliers at Hop Growers of America's annual American Hop Convention. Over the course of the survey's nine years, the BA has tracked significant changes in U.S. craft brewer usage, leading to hop production changes at unprecedented rates. "In 2010, U.S. aroma hop acreage stood at 3,278 ha (8,100 ac), or around 26% of the total 12,662 ha (31,289 ac), with alpha acres accounting for the majority. The aroma hop acreage in 2016 was five times higher than it was in 2010 with aroma acres – all 40,000+ accounting for roughly 80% of all-time high total U.S. acres under trellis - 20,639 ha (51,000 ac) (Brewers Association, 2016). These changes are in response to the aroma hop needs of craft brewers and can largely be accredited to efforts like

those of the BA to facilitate communication between suppliers and brewers, as well as the increasing rate of brewers engaging in forward hop contracting.

Additionally, the findings of this survey seek to incorporate and advance the analyses of Slovene breweries initiated in 2016, outlined within Marketing Analysis of Small Breweries in Slovenia (Pavlovič and Budna, 2016). This study confirmed an increased demand for various types of beer in Slovenia, their supply growth and additional possibilities of employment in agribusiness, catering industry and tourism". The collected data, however, only included details about malt and yeast use. Given the study's conclusion that there was an increased demand for different styles of beer (ie. greater diversity of hop use) and that the analyzed microbreweries...increased their own production by 50% in the period from 2011 to 2015, further analysis of Slovene breweries' hop use was needed.

2 MATERIALS AND METHODS

As many aspects of BA's original hop use survey were preserved in this version as possible in order to provide better cross comparative analysis. Changes were only made to improve the survey's relevance to the Slovene brewing industry.

2.1 Survey Participants, Questions and Procedures

Participating breweries were required to produce in Slovenia and start brewery operations on or before January 1, 2016 in order to effectively document hop use for the entire 2016 production year. There are multiple existing naming conventions for Slovene breweries, including the terms boutique breweries (butične pivovarne), micro breweries (mikropivovarne), restaurant breweries (gostilniške pivovarne), amateur breweries (ljubiteljske pivovarne), macro breweries (makropivovarne), and contract breweries (nomadske pivovarne); however, these conventions differ from source to source and aren't tied to formal definitions that take specific aspects of the business (ie. ownership, production size, ingredient use, etc.) into consideration (Colarič and Mišmaš, 2017; PivoMan, 2017). Instead, 17 of 62 breweries in this study are analyzed by their production volume, years in operation, and/or styles of beers produced.

Breweries were asked to answer questions regarding all hops, by variety, used during the 2016 production year. This also included information about sourcing, contracting and alternative hop formats, such as CO₂ extract and aroma oils.

The survey was carried out by a combination of in-person interviews and electronic submissions using the online survey tool Typeform. Follow-up to clarify entries was done by email. Results were analyzed and presented using Apple Numbers, Google Sheets, and Tableau Public.

2.2 Estimating Procedures

Several methods were used to estimate submitted survey data to provide more accurate findings. First, all hop products used were converted to their nearest pelletized T-90 hop equivalent, in kilograms. This was done using the hop shortages cited by each participating brewery (see 3.4). These weights were then added to the overall weights and counts for each variety. Second, one brewery began production in January 2017, rather than 2016. This brewery's hop use was estimated for the remainder of 2017 and substituted for 2016. Lastly, in a few categories of analyses, data for Pivovarna Laško Union (Heineken International) was excluded as the variance in their production size and, therefore, volume of hop use made it an outlier from the other 16 breweries. Exclusion of this data is noted when relevant.

3 RESULTS AND DISCUSSION

3.1 Hop Varieties Used

Amongst the test group, 49 different varieties of hops were used, with 67.35% of those consisting of imports. For the purposes of this study, a single hop variety coming from two different origins is considered two unique varieties (ie. Cascade grown in the United States is categorized differently than Cascade grown in Slovenia). Parentheses indicating hop origin were included in the survey, as well as in this analysis.

Due to the large variation in production size and, therefore, hop use of the breweries included in this survey, aggregated brewer hop use was evaluated by numerical count (frequency of use), as well as volume (kilograms of hops used). The top 10 most frequently used varieties were Aurora (SI), Amarillo (US), Citra (US), Cascade (US), Chinook (US), Simcoe (US), Savinjski Golding (SI), Mosaic (US), CTZ (US), Styrian Gold (SI). Of these 10 varieties, seven were also listed in the top 10 most used varieties by American craft brewers (Table 1) (Brewers Association, 2016).

Including macro brewers usage, the five varieties used in the highest quantities (kg) were Aurora (SI), Celeia (SI), Savinjski Golding (SI), Citra (US), Cascade (US) and, excluding macro usage, Aurora (SI), Cascade (US), Simcoe (US), Galaxy (AUS), and Amarillo (US). Chinook (US) and Citra (US) were very close behind Amarillo (US). All of the varieties used in the highest quantities were dual-purpose or aroma hops.

The discrepancy between frequency of use and quantity used is due to the fact that the majority of surveyed breweries were using imported hops, even if in small

doses. As in the United States, aroma hops have become increasingly popular globally. All but two of the 17 surveyed brewers used imported aroma hops in 2016. Potential reasons that these imported aroma varieties are being used often and by many Slovene brewers, albeit sometimes in very small quantities, are: production capacity and/or demand, present or perceived issues with availability, high prices, usage being relegated to one-time beers, higher availability of beer recipes using imported hop varieties, or any combination of these reasons. Another possible factor was the limited availability of domestic hop varieties meeting the desired characteristics of new Slovenian brewers (see below).

Table 1: *Most frequently used hop varieties in Slovenia as compared to U.S. craft brewers in 2016 beer production.*

Slovenia	U.S.
1. Aurora (SLO)	1. Cascade (US)
2. Amarillo (US)	2. Centennial (US)
3. Citra (US)	3. Chinook (US)
4. Cascade (US)	4. Simcoe (US)
5. Chinook (US)	5. Citra (US)
6. Simcoe (US)	6. Amarillo (US)
7. Savinjski Golding (SLO)	7. Mosaic (US)
8. Mosaic (US)	8. Crystal (US)
9. CTZ (US)	9. Hallertauer Mittelfrüh (GR)
10. Styrian Gold (SLO)	10. CTZ (US)

The five most used Slovene varieties were Aurora (11 of 17 breweries), Savinjski Golding (8 of 17), Styrian Gold (5 of 17), Bobek (5 of 17), and Celeia (4 of 17), whereas the least used by Slovene brewers were Styrian Eagle (0 of 17), Styrian Fox (1 of 17), Styrian Eureka (2 of 17), Styrian Kolibri (2 of 17), and Styrian Dragon (3 of 17). The most used Slovene varieties by weight were Aurora, Celeia, and Savinjski Golding (Figure 1). When brewers used aroma hop varieties, they were typically imports rather than new Slovenian “flavor hop” breeding lines. These breeding lines were developed to meet the perceived demands of craft brewers. Amongst these new breeding lines, the variety used most by all brewers, as well as the hop used in the highest quantities, was Styrian Wolf (311 kg).

Important to note is that the supply of these new breeding lines was limited in 2016, as various new lines were first introduced to Slovenian growers in 2015 (IHPS, 2015). All certified trial varieties harvested in 2015 combined, including Styrian Wolf, Styrian Cardinal, Styrian Eagle, Styrian Fox, Styrian Dragon, and Styrian Kolibri, amounted to 12,322.87 kg (27,167.28 lbs). In 2016, 18,902.73 kg (41,673.39 lbs) of Styrian Wolf alone was harvested. These higher yields would only have been available to brewers in the latter half of 2016 (September through

December), if at all. From 2015 to 2017, hops from these varieties or rather new breeding lines were predominantly sold outside of Slovenia in Europe and the United States.

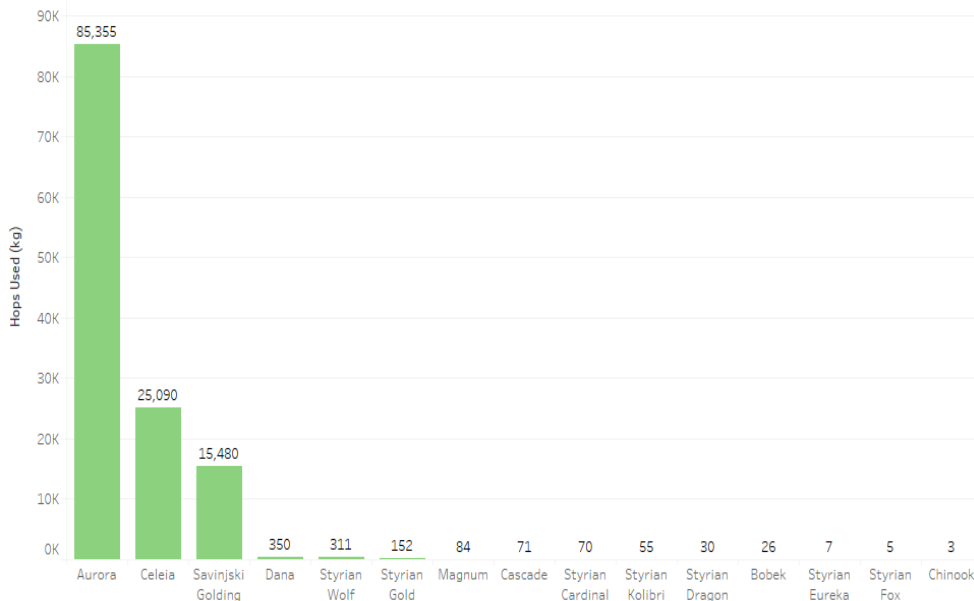


Figure 1: Varieties and quantities (kg) of domestic hops used by Slovene craft brewers involved in research, in 2016

There were some notable hop use differences between breweries. Largely, the longer a brewery had been in production, the more domestic hops they used in 2016. Younger breweries (ie. ≤ 10 years), tend to use more imported varieties of hops, particularly those referred to as “New World” (US) or “Oceania” (NZ, AUS) hops. Breweries older than 10 years predominantly used domestic varieties. Notable exceptions were breweries that used small quantities of imported varieties in 2016, with plans to increase use of these varieties in 2017. The beers produced with these varieties were typically test brews, specialty beers, or seasonal batches. The exception was Aurora, which was used in varying quantities by all but five breweries.

3.2 Hop Dosing Rates

The number of hops used by each brewery ranged from one variety (Savinjski Golding) to 27 varieties. Breweries largely used either whole cone or pelletized hops, with a few also using either CO₂ extract or aroma oils (see 3.4). The breweries regularly using dried, whole cone hops all had direct relationships to

growers since additional hop processing (ie. pelletizing) was unnecessary for their use (see 3.6).

Brewery hopping rates (kg hops per hl) ranged from 0.25 kg / hl (0.14 lbs / US bbl) to 2.71 kg / hl (7.02 lbs / US bbl) (Figure 2). Data from Pivovarna Laško Union was determined to be an outlier and excluded from this section of analysis. The average hopping rate for the group was 0.96 kg / hl (2.12 lbs / US bbl). This is considerably higher than the 0.68 kg / hl (1.50 lbs / US bbl) average the BA obtained for U.S. brewers in 2016 (Brewers Association, 2017), though a higher number of breweries with, on average, higher production volumes were included in the BA’s survey of U.S. brewers.

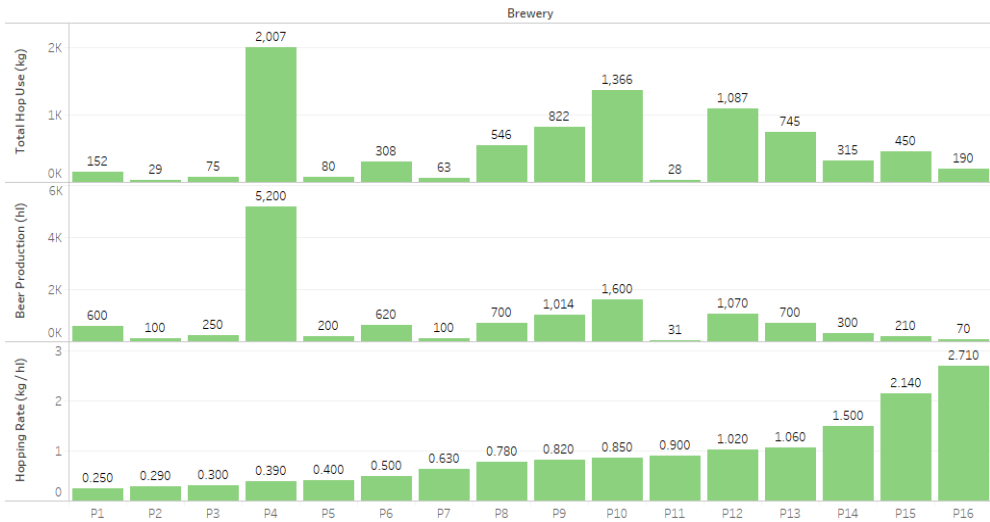


Figure 2: Hop dosage rates relative to hop use (kg) and beer production (hl).

Participating breweries (excluding Pivovarna Laško Union) are represented anonymously by each column. Row 1 (top) shows each brewery’s total hop use (in kg). Row 2 (middle) shows annual production (in hl). Row 3 (bottom) shows hopping rate (kg hops / hl production).

Results did not show a strong correlation between hopping rate and brewery size. There was, however, a tendency for breweries predominately using Slovenian hops to have lower hopping rates than the group average. There was also a tendency for the breweries with hopping rates above the average rate to use a larger variety of different hops (Figure 3).

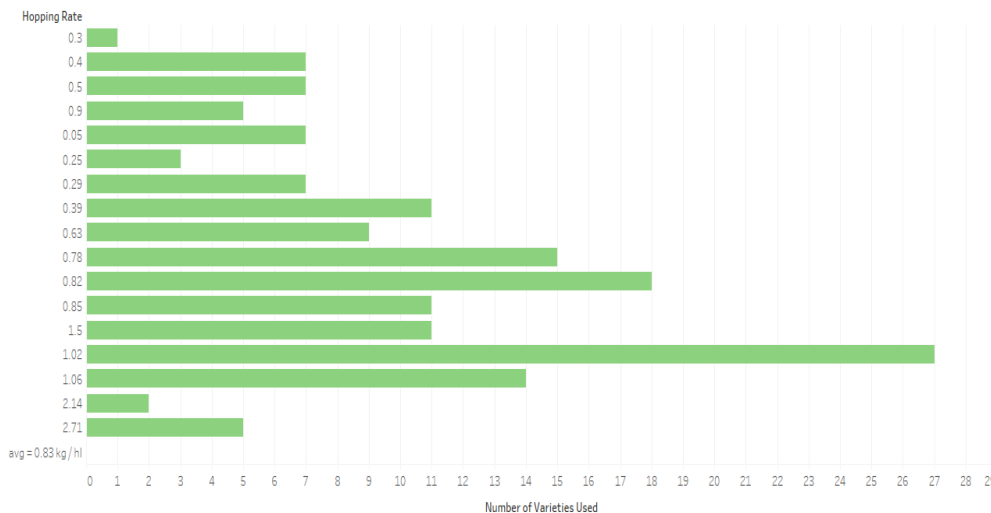


Figure 3: Average hopping rates (kg / hl) in relation to total number of hop varieties used.

3.4 Hop Shortages

Of 17 breweries, six cited shortfalls for specific varieties in 2016, all of which were imports. Most notably, these included Citra (212 kg combined shortfall) and Amarillo (135 kg combined shortfall). These shortages are consistent with 2016 shortages in the U.S. and are most likely due to both varieties' proprietary status, the patents for which will expire in the next few years. Additionally, in the case of Citra, it is a lower yielding variety and "[purchasing Citra] will come at a premium to other varieties, since its yield is relatively lower. This also serves to illustrate the agronomic reality that in poorer crop years with lower yield, the cost per pound will increase." (Brewers Association, 2017; Washington State University, 2010). For this reason, there could be shortages based on supply (real or perceived) as well as price constraints despite Citra production increasing more than 20 times (1,169 ha) between 2010 - 2015 and being the fifth most highly produced hop in the U.S. in 2016 (Barth-Haas Group, 2016; Barth-Haas Group, 2017). Only half of the breweries who experienced Citra shortages contracted for hops in 2016 (see 3.6).

According to the survey results, the remaining shortages were Columbus (US), Simcoe (US), Centennial (US), Azacca (US) and Northdown (UK). There were no shortages for Slovenian varieties. Breweries using the largest amounts of Slovene hops either had contracts with merchants, or direct relationships to growers. The brewers with direct relationships to domestic growers worked without contracts, which meant that preferred varieties were sometimes unavailable; however, most

voiced that the advantages of not engaging in a contract (ie. flexibility, lower prices, etc.) outweighed having to make hop substitutions. To rectify shortages, brewers either changed recipes, substituted similar hop varieties, or used hop oil extract in lieu of whole cone or pelletized hop availability.

3.5 Hop Surpluses

Only two breweries cited hop surpluses for 2016 and both were able to incorporate those surpluses into 2017 production. Both breweries source hops under contract. Interesting to note is that one of these breweries cited an intentional surplus in Citra as a safeguard against shortage. Citra was the culprit of the largest numbers of hop shortfalls by Slovene brewers in 2016 (see 3.4).

The most common method for dealing with hop surpluses was asking the dealer or grower to hold a portion of the contract for the following year. Several brewers also sold surplus hops to homebrewers; however, each instance was as a favor rather than to rectify their surplus.

3.6 Sourcing and Contracting

Of the 17 breweries surveyed, six breweries contracted hops for the 2016 season. All breweries that produced 600 hl or less in 2016 (52.94% of test group) were without hop contracts and the largest brewery without a contract produced 1,014 hl in 2016. The main reasons the remaining 11 cited for not contracting were size (ie. too small for contracts), unpredictability of needs due to uncertain growth potential, and that it was unnecessary based on the amount of hops used, close relationships with growers/merchants, and/or ability to change recipe based on hop variety availability from season to season.

A brewer engaged in three-year contracts voiced similar concerns, stating they would prefer to contract for just one year. Contracting beyond one year restrains the brewery from adapting to global beer industry trends, especially those marked by frequently changing hop profiles.

4 CONCLUSIONS

With 82.35% of surveyed breweries using hops from outside of Slovenia, there is a clear trend amongst Slovene brewers to offer styles consistent with those popular in the global beer market. In fact, seven of the top 10 varieties used in Slovenia are also amongst the top 10 most highly used by American craft brewers. Given this demand and the previously mentioned supply shortages for these hop varieties, it will be increasingly important for Slovenian brewers to communicate their needs to the global hop growing community.

Alternatively, there's potential for Slovenian brewers to take advantage of increasing domestic aroma and flavor hop acreage. As previously mentioned, Slovenian aroma and flavor hop acreage is increasing following a decade-long 38% decrease in cultivated hop areas. As of 2016, acreage was still about 20% below the 1,856 ha (4,586.28 ac) peak of 2002, meaning cultivated areas could continue to increase given vocalized, sufficient demand.

With just 85% of Slovenian hops contracted for 2017 and 2018 (and even less in projections for 2019 - 2022), there will also be adequate domestic access to these varieties, pending the current predicted yields. Additionally, the estimated average domestic aroma hop prices were between 7.5 Euro / kg (spot market) and 5.2 Euro / kg in 2016 (contract) (IHGC, 2017). Considering that the average price for American hops was 11.60 Euro / kg in 2016, with the most popular imported aroma varieties reaching small quantity prices of approximately 40 Euro / kg on the spot market, there could be both financial and operational advantages for Slovenian brewers who source domestic hops rather than imported varieties (Lupulin Exchange, 2017).

5 REFERENCES

- Barth S., Meier, H. The Barth Report: Hops 2015 - 2016. Barth-Haas Group website. <http://www.barthhaasgroup.com/images/mediacenter/downloads/pdfs/412/barthreport20152016en.pdf>. July 2016. p. 24 - 25.
- Barth S., Meier, H. The Barth Report: Hops 2016 - 2017. Barth-Haas Group website. <http://www.barthhaasgroup.com/images/mediacenter/downloads/pdfs/412/barthbericht20162017en.pdf>. July 2017. p. 24.
- The Brewers of Europe, Združenje Pivovarn Slovenije. Key Figures 2015: Slovenia. The Brewers of Europe website. http://www.brewersofeurope.org/site/countries/figures.php?doc_id=664. 2016.
- The Brewers of Europe, Združenje Pivovarn Slovenije. Key Figures 2016: Slovenia. The Brewers of Europe website. http://www.brewersofeurope.org/site/countries/figures.php?doc_id=664. 2017.
- Colarič A., Mišmaš D. Slovenske pivovarne map. Pivopis website. <http://pivopis.si/slovenske-pivovarne/>. Accessed October 2017.
- IHPS. Hop Growing - Introduction. IHPS website. <http://www.ihps.si/en/hop-growing/introduction/>. Inštitut za hmeljarstvo in pivovarstvo Slovenije, Žalec. Accessed October 2017.
- IHPS. Annual Report of the Institute for 2015. IHPS website. http://www.ihps.si/wp-content/uploads/2016/08/letno_porocilo_ihps_2015.pdf. Inštitut za hmeljarstvo in pivovarstvo Slovenije, Žalec. May 2016.
- Lesjak A. Združenje Pivovarn Slovenije, data provided by personal email correspondence, October 2017.

Lupulin Exchange. Lupulin Exchange website.

<https://lupulinexchange.com/listings?page=3&q=citra&SortBy=1>. Accessed October 2017.

Pavlovič M., Hop industry. Quality management, decision support modeling. Verlag, Dr. Kovač, Hamburg. 2014. 106 p.

Pavlovič M., Budna P. Marketing analysis of small breweries in Slovenia (In Slovenian). Hmeljarski bilten. Slovenian institute of Hop research and brewing, Žalec. 2016. p. 56.

IHGC. Economic Commission - Summary Reports. International Hop Growers' Convention (IHGC). Yakima, WA. August 2017.

PivoMan. Slovenske pivovarne. PivoMan website. <http://pivo-man.blogspot.si/search/label/Seznam%20Pivovarn>. Accessed October 2017.

Roth B. Trend Watching: 2016 Hop Production and the Rise of Citra. This Is Why I'm Drunk website. <https://thisiswhyimdrunk.blog/2016/12/20/trend-watching-2016-hop-production-and-the-rise-of-citra/>. September 23, 2016. Accessed October 2017.

Swersey C. Help Hop Growers Help You. Brewers Association website.

<https://www.brewersassociation.org/news/help-hop-growers-help/>. August 1, 2016. Accessed October 2017.

Swersey C. Hop Industry and Craft Brewing Market Update. Brewers Association website. <https://www.brewersassociation.org/archived-power-hour/hop-industry-craft-brewing-market-update/>. February 16, 2017. Accessed October 2017.