

Hop report - crop 2021



1. The situation during the crop year and the quality

A/ Development of the weather and the situation in production 2021

The monthly Hop Reports 2021, regularly published on the web sites of Bohemia Hop, a.s. Žatec - www.bohemiahop.cz are enclosed with this Report. Tables No. 1 and No. 2 indicate summarized data of temperatures and precipitation during the whole vegetation period (April–August) in 2021, compared to the same period of 2020 and to the 30 years' long-term average (1981–2010).

Table 1 – Temperature (°C)

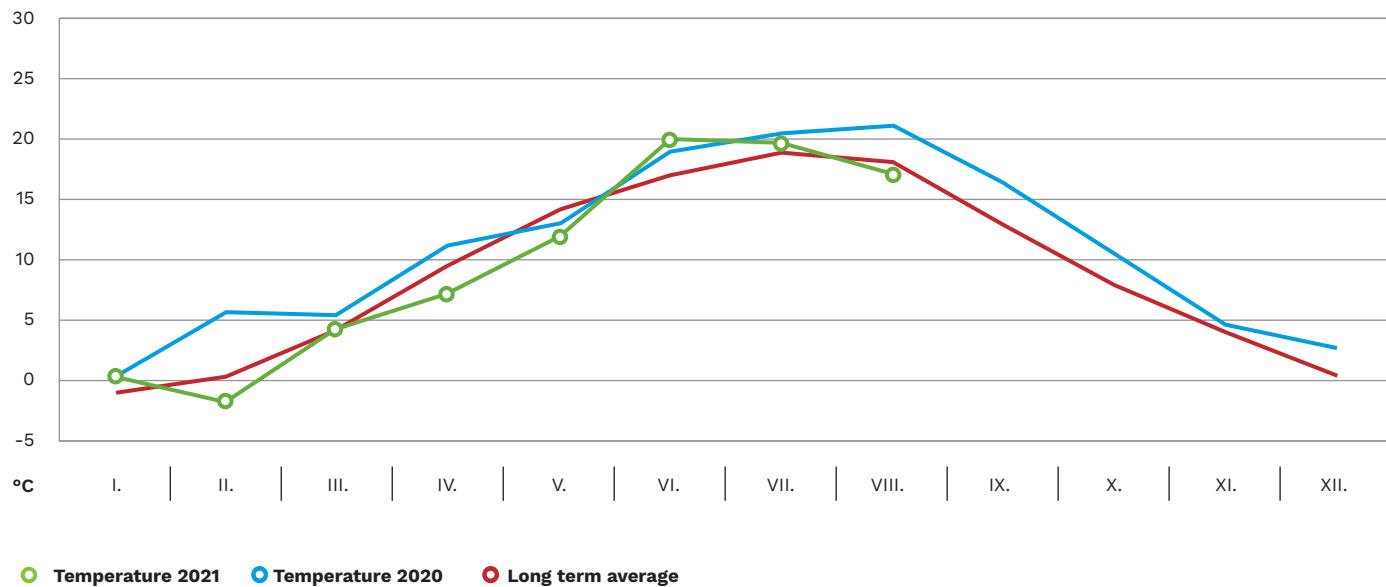
Month	Average temperature		Difference +-	30-years average	Difference +-
	2021	2020			
April	7,17	10,20	- 3,03	9,10	- 1,93
May	12,13	12,94	- 0,81	14,20	- 2,07
June	20,3	18,45	+ 1,85	17,00	+ 3,30
July	19,95	20,11	- 0,16	19,00	+ 0,95
August	17,47	21,18	- 3,71	18,30	- 0,83
Total	77,02	82,87	- 5,86	77,60	- 0,58

Table 2 – Precipitations (mm)

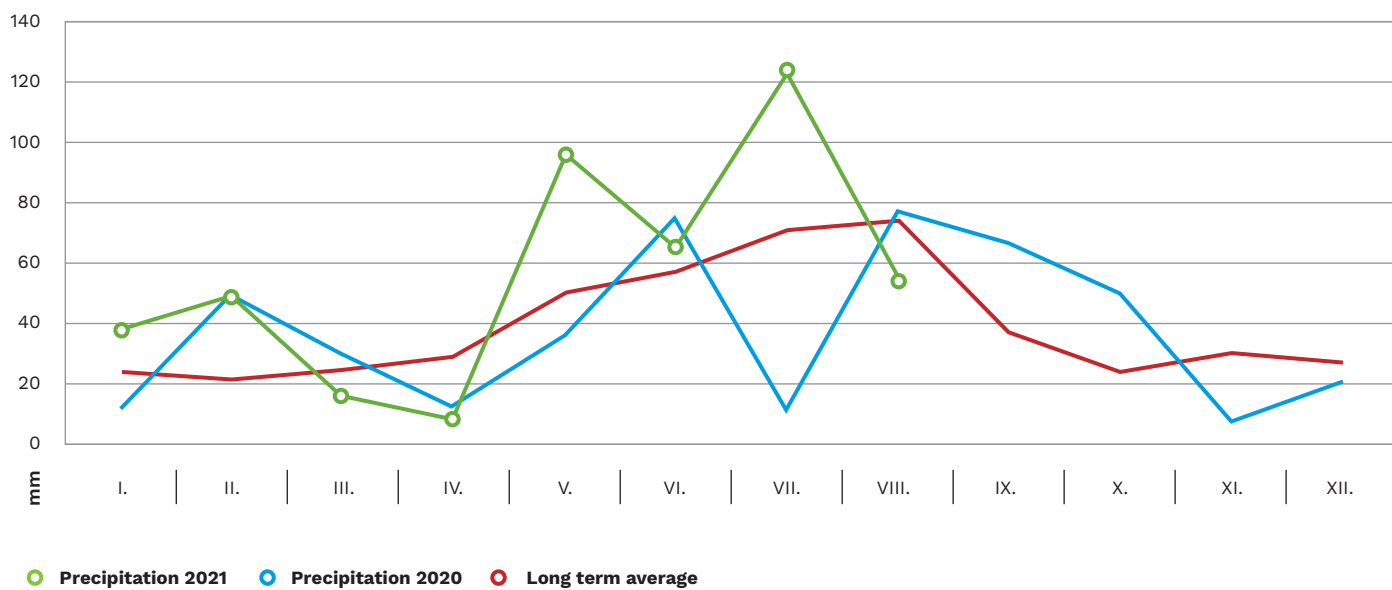
Month	Total precipitations		Difference +-	30-years average	Difference +-
	2021	2020			
April	6,80	12,80	- 6,00	30,70	- 23,90
May	97,40	37,40	+ 60,00	52,00	+ 45,40
June	64,60	73,60	- 9,00	59,10	+ 5,50
July	123,20	12,60	+ 110,60	69,40	+ 53,80
August	56,60	78,40	- 21,80	70,80	- 14,20
Total	384,60	214,80	+ 133,80	282,00	+ 66,62

The data indicated above are accompanied by graphs illustrating the average temperatures and the total of the precipitations per month, covering period of January–August 2020 and January–August 2021. (Graphs 1 and 2)

Graph 1 – Temperature in 2021 and 2020 compared to a long average



Graph 2 – Precipitation in 2021 and 2020 compared to a long average



The nature of the weather during the first quarter of 2021 was characterized by lower average temperatures in comparison to 2020. Compared to the values of the long-term average the oscillations of the average temperatures in individual months were minimal. The coldest month of the first trimester of this year was February. It was caused by very low average daily temperatures between Feb 7 to Feb 16, 2021, which did not exceed the freezing point even once.

In terms of precipitation, the first quarter of 2021 was above the level of both the long-term average of 1980 – 2010 as well as of 2020. The monthly total precipitation was significantly exceeded in January and February, when there were 184 % and 222 % of precipitation compared to the long-term average, respectively. In the middle of the first decade of February, after several years, about 20 cm of the snow fell in Žatec (Saaz) region as well. The snow cover lasted thanks to cold weather until February 16, 2021.

In terms of the temperatures this year's April was below average. In fifteen days the temperatures decreased below the freezing point. The feeling of the temperature was moreover lowered by fresh wind, which, however, significantly drained the soil. Precipitation in April were considered catastrophic. Only 6,8 mm of the precipitation were recorded – it represents 22 % of the long-term average.

May 2021 was the coldest May in previous 30 years. The average temperature was even lower than in the same period of previous year and compared to the long-term average the difference was – 2,07 °C. Beginning of the month until May 8 was the coldest period, but a significant, longer-lasting warmer period did not occur until the end of the month. The average temperatures varied constantly around 12 °C during all the time. Also for this reason this year's average temperature in May stayed below the long-term normal. In terms of precipitation this May was very good in comparison to previous year and reached approx. 187,3 % of the long-term average. Based on the state of the water regime we rated the situation very good in this year.

In the first two decades of June the dry weather prevailed for practically the entire period. The situation changed dramatically in the third decade of the month, when in some localities there came very strong rainfalls, which unfortunately in Rakovník region resulted in heavy storms accompanied by hails in June 24 and June 29, 2021. In total, approx. 900 hectares of the hop gardens were damaged in June in the range of 10 % upto 100 %. About 200 ha of the hop gardens were estimated as totally destroyed. It concerned especially the municipalities of Petrohrad, Hořovičky, Vrbice, Heřmanov, Zderaz, Kolečovice, Kněžves, Chrástany, Kounov, Mutějovice, Pochvátov, Kroučová and Mšec. The precipitation was of stormy character and in some localities it fell up to 150 mm per month. The situation in the development of the temperatures was relatively favourable, with the exception of the period between June 16 and June 21, when the heats reached the tropical levels, which are not optimal for the development of hops.

July was for hops quite favourable in terms of the development of climatic conditions. The average monthly temperature equalled practically to the long-term average, without major daily fluctuation. The amount of the precipitation was very good in the Žatec (Saaz) region, in July 2021 it reached 177,5 % of the long-term normal. Due to high daily precipitation, one hectare of the hop garden fell on July 14, 2021 in the municipality of Postoloprty. Although the precipitation was of a stormy nature with differences in amount, it rained more than long-term average in all areas.

It rained practically at the end of the first decade and then during the third decade of August, 2021. The precipitation at the end of the month were mostly of the stormy character and that is why they are different in different localities. Due to the precipitation 24 ha of the hop gardens fell in the Žatec (Saaz) region, out of this 22 hectares of the Saaz variety; and 5,5 ha of the hop gardens fell in the Ústěk (Auscha) region. Strong rains then caused worries to the hop growers during the harvest. The average temperature in August was below the long-term normal by 0,83 °C.

B/ Quality: alpha contents in original, aroma, the appearance of the cones, the pests

The nature of the weather in the first quarter of 2021 enabled the farmers to begin the spring works in majority of the area as normal. The start of the spring works in part of the fields was limited by the precipitation occurred during winter time, as the fields were waterlogged. It reflected also in the building of the new hop gardens. The spring works started in March, when especially the harrowing of hop gardens took place. At the end of March the growers started with the pruning of the new varieties of hops.

Also the weather in April enabled the hop growers to carry out the spring works in usual time. The weather without rains made possible to cut the hops in a normal time. The growers then could regulate the timing of the pruning operation according to their needs.

The pruning was followed by the hanging of the training wires and their anchoring into the soil. The works on the hop gardens were done by the foreign workers, in majority. The cold weather however influenced negatively the growth of hop plants, which practically did not grow. The time difference in the pruning of hops therefore disappeared and there was the expectation that the hops would grow at the same time regardless of the time of pruning operation.

Very cold weather, which lasted practically throughout the whole May, influenced negatively the growth of hops. Due to the fact that hops in the beginning of month grew very slowly, the growers had to postpone the start of the hop training which was demanding on planning of the labour force needs. The time of the training really moved to May 15, what only few growers remember. The training of hops therefore took place continuously according to the state of the plants on individual hop gardens. As far as the growth of the plants is concerned, the areas where the late cut was carried out were harmed the most seriously. Therefore, it was not possible to finalize the training until the end of May and the hop plants were trained also in the first decade of June. Simultaneously also other works, as additional fertilizing and hilling, were delayed. The delay of the works in hop gardens was ten to fifteen days.

The growth and development of hops throughout June was very good in hop gardens which were not damaged by the hail storms. Approximately 80 % of the growth reached the height of trellis. Due to current climatic conditions and to the state of hops the elongating growth continued also in July.

The elongating growth continued until the end of the second decade of July and in some younger hop gardens, which were cut later, even to the end of month. Habit of the plants was very nice in this year, in some hop gardens even massive. In continuity to the previous development of the plants, the hops started to bloom in this year, similarly to last year, only at the end of the second decade of month. The deployment of flowers was relatively good, the only negative was that it happened in upper parts of plants. Creation of cones was provisionally at the beginning at that time and it differed according to the variety of hops, the age of the hop gardens and the time of pruning.

The condition of the hops in terms of habit was very good. The deployment of flowers was very nice, although in some hop gardens the creation of the hop cones did not correspond to the expected state and the cones remained small. The harvest started by individual growers during the time horizon between August 16 (fallen hop gardens) and August 28, 2021. Based on the assessment of the state of hops a higher harvest was expected compared to previous years. The first laboratory analyses showed a slightly higher content of alpha acids in the Saaz in comparison to last year. We therefore estimated a slightly above-average content of alpha bitter substances in comparison to the average of previous five years, especially for the Saaz variety. For other varieties we did not have enough information for a quality estimate.

C/ Chemical protection of the hops

Due to the climatic conditions, when the hops did not grow sufficiently, some areas were treated against alfalfa snout weevil (*Otiorrhynchus ligustri* L.), which appeared in spite of the cold weather. An own monitoring of this pest was recommended according to the positions of individual hop gardens. The spraying by plant protection product Actara 25 WG, which was permitted by the Regulation of the Central Institute for Supervising and Testing in Agriculture (ÚKZÚZ), was applied within the period of March 26 to June 20, 2021.

Initial character of the climate of May was adverse to the development of downy mildew of hops (*Pseudoperonospora humuli* Miy et Takah.). Nevertheless it was recommended to carry out the protective intervention consisting in timely application of the preparation Aliette 80 WG. In the hop gardens where the occurrence of the spike sprouts is higher every year, the intervention with the preparation Prolifer was recommended. The precipitation during May led to the increase of the infective pressure of the pathogen. It was recommended to carry out the second treatment with the preparation Aliette 80 WG, or alternatively with the preparation Curzate K. The character of the May weather was the reason why the hop aphid (*Phorodon humuli* Schrank) was not noticed on the hops. Therefore it was not necessary to carry out the treatment against this pest. Cold weather was not favourable also to the development of the red spider mite (*Tetranychus urticae* Koch) and it slowed down significantly its population dynamics. A special chapter of this year was the occurrence of the alfalfa snout weevil (*Otiorrhynchus ligustri* L.). Since the beginning of May a careful monitoring of this insect was recommended and also the treatment with the preparation Actara 25 WG on the areas, where the threshold of the agricultural harmfulness was exceeded. By the same way this preparation destroyed the spring generation of the flea beetle (*Psylliodes attenuata* Koch).

Although the conditions for the first treatment against downy mildew of hops were not met at the beginning of June, it was recommended – due to the occurrence of the spike sprouts – to carry out this treatment between June 8 and June 15, 2021. The preparations Folpan Gold, Bellis, Orvego or Ortiva could be used. Furthermore, treatment was carried out in the period from June 23 to June 30, 2021, above all due to the abundant precipitation during the third decade and due to the emergence of the secondary infection. In addition to the above mentioned preparations also the preparation Revus could be used during that period. On the hop gardens with higher incidence of spike sprouts then the treatment with curatively active fungicide Curzate K was performed in compliance with the recommendation.

Colder weather caused a significant delay in the overflight of the hop aphid and its weak occurrence in early June. It was therefore not necessary to carry out the treatment against this pest. It was recommended to perform the treatment against hop aphid with the preparation Movento 100 SC during the period between June 28 and July 4, 2021, what is also the optimal time in terms of the distribution of the active substance through the conductive tissues of plants.

Cold weather also affected the population dynamics of the red spider mite. A thorough monitoring was performed and where the critical number (5 mites per leaf) was reached, the treatment with Nissorun 10 WP and Ortus 5SC was carried out. High temperatures during the second half of the month influenced the population dynamics of the red spider mites, whose occurrence on the hop plants was already evident. Then the farmers continued working within the intentions of the recommendations for treatment against hop aphid.

Intensive pressure of downy mildew of hops continued also in July. With regard to the high infection pressure, the continuing nature of the weather and the transition of hops to the generative phase the fourth and fifth protective interventions against downy mildew of hops were carried out. The preparations Ortiva, Bellis, Revus or Folpan Gold were applied. The animal pests, both hop aphid and red spider mite, were eliminated by the preparation Movento 100 SC. It was also recommended to monitor the symptoms of powdery mildew (*Sphaeroteca humuli* (DC) Burr.). The preparations Bellis, Ortiva and Vivando are available against this disease.

The health condition of hops was still relatively good at the beginning of August. However, high pressure from downy mildew of hops persisted. The question was whether the growers would be able to maintain this state until the end of the harvest.

Following Table demonstrates the contents of alpha-bitter substances in hops according to individual regions and varieties, as analysed in the laboratory of Chmelařství, cooperative Žatec.

Following Table demonstrates the results of alpha-bitter substances in hops according to individual regions and varieties, as analysed in the laboratory of Chmelařství, cooperative Žatec.

Table 3 – Alpha-acid content in original material according to varieties and regions (in %)

Region	Saaz	Sládek	Premiant	Kazbek	Saaz Late	Agnus
Saaz	4,20	-	-	-	-	-
Auscha	3,80	-	-	-	-	-
Trschitz	3,20	-	-	-	-	-
Czech Rep.	4,00	7,50	8,50	-	-	11,00

Obs.: The results of the analyses of other varieties are still not available.

D/ Estimation of acreage and yields according to regions

The harvested acreage has stagnated during last four years and it remains stable around the level of 5000 ha. For the Crop 2021 the harvested acreage is shown in following Table. The data indicated were kindly conceded by the Central Institute for Supervising and Testing in Agriculture in Žatec (data up to August 20, 2021 – comparison to August 20, 2020).

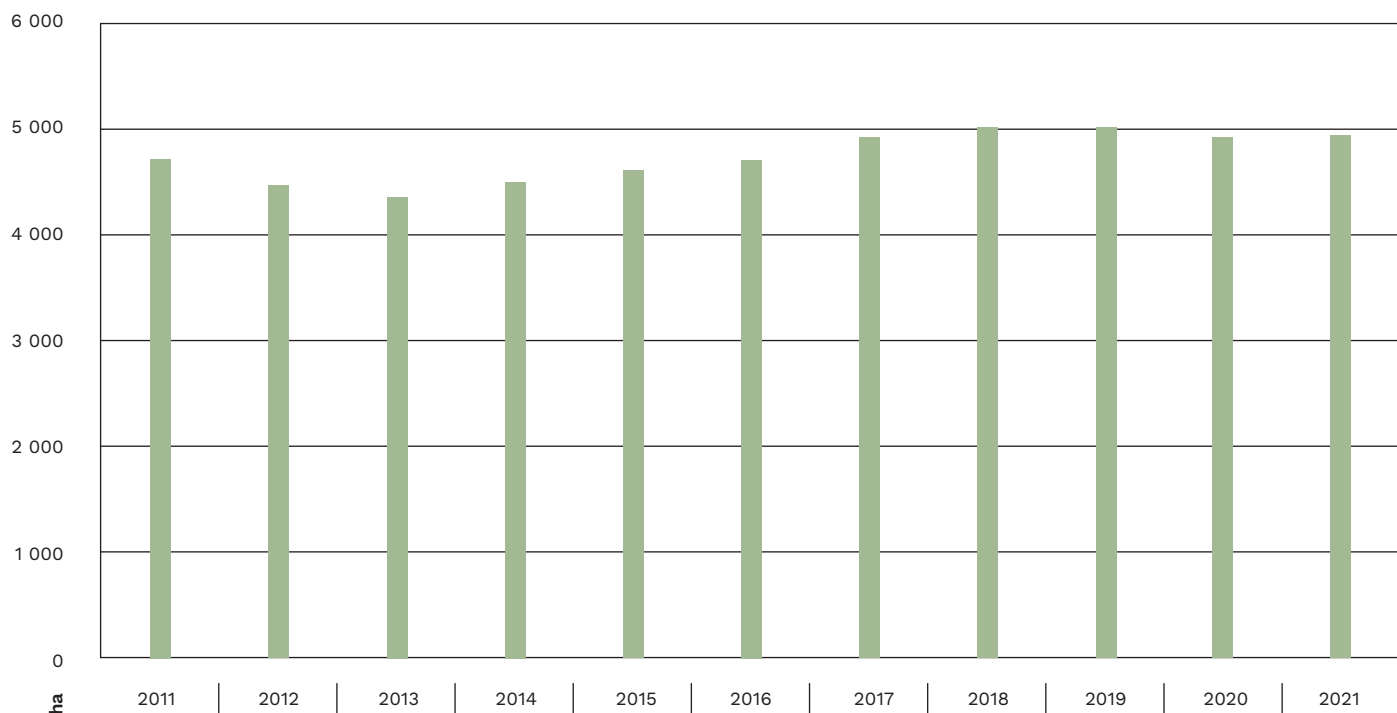
Table 4 – The acreage of hop gardens in the Czech Republic (ha)

Region	up to 20.8.2021	up to 20.8.2020
Saaz	3 833,8	3 836,6
of it Saaz variety	3 299,8	3 320,0
Auscha	516,9	504,1
of it Saaz variety	410,4	410,6
Terschitz	620,6	625,6
of it Saaz variety	473,5	485,5
Czech Republic	4 971,2	4 966,3
of it Saaz variety	4 183,6	4 216,1

The same level of the areas is presupposed also for next years.

In order to illustrate the development of the acreage of hop gardens in the Czech Republic during previous ten years we enclose the graph covering the period of 2011–2021.

Graph 3 – The development of the acreage of hop gardens in the Czech Republic



It is again very complicated to make the accurate estimates of the production of hops in the Czech Republic in this year, due to differentness of the beginning of the harvest by individual growers, the overall condition of hops in relation to the cones creation and therefore due to big variation in yields among growers and the hop gardens. In addition, these aspects were accompanied by relatively large damages of the hop growths in Žatec (Saaz) region by hailstorms in June. The exact results will be known after the summarization of individual **“Producers declaration about the number and the weight of marked packing with hops according to the cadastral territories and varieties of hops”**, i.e. during the second week of December.

Table 5 – Estimate of the crop 2021 according to regions (total)

Region	Harvested area (ha)	Production (t)	Yield in t per ha
Saaz	3 833,7	6 430	1,68
of it Saaz variety	3 299,8	5 100	1,55
Auscha	516,9	930	1,80
of it Saaz variety	410,4	670	1,65
Terschitz	620,6	1 110	1,79
of it Saaz variety	473,5	740	1,56
Czech Republic	4 971,2	8 470	1,70
of it Saaz variety	4 183,6	6 510	1,56

2. Forecast of the production in the future (2021–2022)

A/ Expected replacement of the varieties and hypothetical production of individual varieties

Table 6 – Comparison as per the variety composition in 2020–2021

Variety	2021 ha	2020 ha	Difference ha 21/20
Saaz	4 184	4 216	- 32
Agnus	60	53	+ 7
Kazbek	22	26	- 4
Premiant	217	196	+ 21
Sládek	374	365	+ 9
Saaz late	44	44	0
Saaz special	41	41	0
Others	29	25	+ 4
Czech Republic	4 971	4 966	+ 5

B/ Expectation of the planting of new varieties and the yields

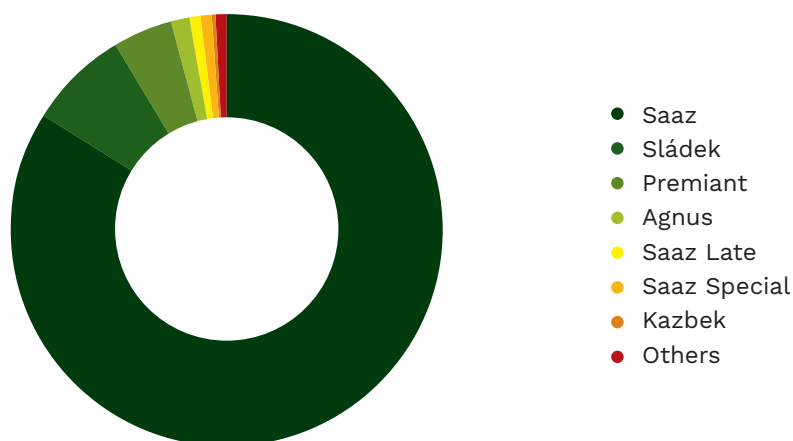
It can be stated that the trend in the renewal of hop gardens and planting has stabilized. According to the information from the rootstock producers, there is still interest among growers in the Saaz variety and then we see an increasing interest in new varieties, especially Premiant and Sládek. The amount of ordered seedlings represents an area of approximately 240 ha. However, it will mostly concern the renewal of hop gardens, especially in case of the Saaz hops. The overall situation will be also influenced by the necessity of re-building of fallen constructions.

C/ Expected production areas

Table 7 – Composition of individual varieties on harvested area in 2021 and in 2020 (ha)

Variety	area 2021	%	area 2020	%
Saaz	4 183,6	84,16	4216	84,90
Agnus	60,4	1,21	53	1,06
Kazbek	22,2	0,45	26	0,52
Premiant	216,9	4,36	196	3,95
Sladek	373,8	7,52	365	7,35
Saaz Late	44,1	0,89	44	0,88
Saaz Special	41,4	0,83	41	0,82
Others	28,8	0,58	25	0,52
Czech Republic	4971,2	100,00	4966	100,00

Graph 4 – Composition of individual varieties on harvested area in 2021



3. Trends on the hop market

A/ Market report

The hop harvest 2021 started due to the cold spring weather by several days later than usual. We expect that due to the favourable climatic conditions from June to August the final production will be very good.

Compare to crop 2020 we see that especially the main Czech hop variety Saaz performed very well both in yields and alpha content which can be judged as over average from a long-term view. This will not only enable us to fulfil all contracted volume but also gives us a possibility to fulfil the postponed volumes from previous crops. This year results also provides a unique opportunity for brewers to create strategic stocks with high alpha content aroma hops.

We expect also good yields and alpha content of other Czech varieties where the harvest still goes on and which are currently transported to our warehouses.

The overall market situation is still influenced by the pandemic and we still see markets with various types of lockdowns and measures influencing the beer consumption. We monitor the situation closely.

Japan: Japan is currently of the markets still facing lockdowns connected with the pandemic situation and this state will probably last till the end of September which has a negative effect on the consumption of beer. We shall discuss the situation in detail with our partners in October.

China: We can see that despite the pandemic the brewing sector still increases the share of premium segment. We still register a strong demand for quality Czech hop varieties which is reflected in long-term contracting.

Vietnam, India: The beer production in Vietnam was negatively hit by the pandemic in the last two years. However we still register a demand for Czech hops from these markets.

South and North America: Despite the pandemic measures we see an increasing trend in contracting from these markets and stable demand for Czech hops.

Europe: In Europe we cooperate with all the major brewing companies as well as with a number of mid size and small brewers. We still see a growing interest in Czech hops which is reflected by both short term and long term contracting.

Czech market: We expect that after last year beer production drop due to pandemic the market will return to some growth. Some brewers even expected very good year which was confirmed by their purchases of hops. There is still also a growth in the craft market even though some outlets have not reopened yet. We believe that also the tourist industry will soon operate as in previous year which could again make a positive impact on Czech beer production.

4. Quality Control:

The change of technology and packing material for the crop 2021

Hop processing plant CHMELARSTVI and investments for new processing season

The hop processing line of CHMELARSTVI in Zatec continued in its annual investment policy and invested again in modernizing the pellet plant as well as hop storage. The main investment for the start of 2021 processing season was a FANUC robot for automatization of the process of carton loading on pallets. The new robotized place enables handling of not only standard boxes of 20-40 kg which the line had until now but also handling of large boxes for 90-150 kg plus automated handling of pallets. This will not only speed up the process of large box packaging but save labour costs and make the operations much easier for the operators. The pellet plant worked also on modernization of the refrigerating system for the pellet 45 production.

The main cold storage plant was equipped with 2 new loading ramps which will help the unloading of trucks with hops from farmers. The hop storage has 2 new fork lifts - one electrical for inside and a big one that is moving train wagons inside the CHMELARSTVI plant rail system. The laboratory of CHMELARSTVI invested in new devices for better sample preparations and is preparing itself for a large renovation next year.

5. Pesticide Residua

A/ Supplement to the instruction regarding spraying within previous year

Basic trends of the hop protection, as well as protection of other agriculture commodities are fully subject to the rules valid in European Union.

B/ Newly used pesticides

By comparison of the Methodology of the Hop Protection in 2021 and 2020 we registered following changes. The inclusion of new preparations into the methodology of the hops protection in 2021.

Name of Preparation	Active Substance	Effectiveness
YOROI	acetamiprid	Phorodon humuli
Afinto	flonicamid	Phorodon humuli
Kendo 5CS	lambda-cyhalothrin	Miridae
Alginure	potassium phosphate	Pseudoperonospora humuli
Vivando	metrafenon	Sphaerotheca macularis
Sonata	bacillus pumilus	Sphaerotheca macularis

C/ Control system for pesticide residues

Chmelařský institut, s.r.o. Žatec (Hop Research Institute, s.r.o. Žatec) did not receive any instructions in order to change the control system of pesticide residua, so that it goes on in compliance with the present trends.

Connection to EUROFINS SOFIA GmbH Berlin, an international certified laboratory, continues and in compliance with the facilities of the laboratory we extend also the spectrum of analyses of active substances. Simultaneously, in this year we extended even more the cooperation with Chmelařský institut s.r.o. Žatec, which is equipped – since 2016 - with new laboratory facilities for analyses of pesticide residua and since 2020 its accreditation ČIA according to the standard ČSN EN ISO/IEC 17025:2018 was approved.

D/ Protection of hops in the crop year 2021

The protection of hops in 2021 carried out by our suppliers was subject to the Methodology of the Protection of Hops for the year 2021 and of the List of the Preparations Approved for the Protection of Hops in 2021, issued for the companies Chmelařství, co-operative Žatec and Bohemia Hop, a.s.

Due to the fact that we have agreed in the Contracts for Dried Hops, concluded with the suppliers, an obligatory deadline for sending of the “List” until the 31st March of the current year, we need to know possible requirements for the adaptation of allowed chemical preparations before that day, preferably up to 28th of February of current year.

Prepared by Jaroslav Hájek
Saaz, 11th September, 2021