

## TASTING REPORT of New England India Pale ALE (NEIPA) Kazbek PE 45

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### INTRODUCTION

BOHEMIA HOP Company together with the Hop Research Institute Co., Ltd. aimed to focus on current world trends in beer styles, in which hop varieties of Czech provenance can be used. Last year, BOHEMIA HOP also launched a new product, the Kazbek variety in the form of enriched pellets type 45 (PE 45) with a higher content of alpha acids and essential oils (<http://www.bohemiahop.cz/330-so-a-little-different-kazbek-cup-2020>). The two above-mentioned organizations decided to brew beer in the increasingly popular NE IPA style using the Kazbek variety in this particular form. The production technology and brewing process were designed by the brew master of experimental brewery Jan Hervert after consultation with Michal Havrda from the Pioneer Beer Brewery in Žatec, on whose initiative this product was created.

During processing hops to pellets type 45, hop cones of raw hops are cleaned and homogenized. The next stages are milling and separation, which take place in an environment of -30°C where the lupulin glands are separated due to their frozen form from the rest of the hop cones material with sieving. The lupulin glands are the carriers of the bitter substances. Before pelletizing, both parts are blended to achieve the final required concentration. The product made in this process of mechanical enrichment can be considered as 100 % natural product. (PODSEDNÍKOVÁ, Markéta. New Hop Product Kazbek PE 45. *Czech Hops 2020*. Praha: Ministry of Agriculture, 2020, 37-39.)

Not only have these PE 45 higher content of alpha acids but they also have higher content of essential oils. On the contrary, the content of ballast substances is reduced.

The main tasks were to test the use of PE 45, their impact on technological losses in production and to determine the drinkability of beers and the influence of PE 45 on the resulting sensory analysis of NE IPA. In conclusion, we wanted to see if this form of Kazbek can replace or supplement imported varieties that are primarily used for this beer style, however, are less affordable.

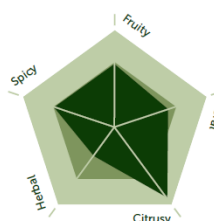
According to breweries, if we compare hopping with imported varieties versus hopping with PE 45 at a dose of 15 grams per litre and a production volume of 20 hl of beer (approx. 30 kg of hops), production costs will be significantly reduced and the potential of Czech hops will be used.

## METHODOLOGY AND PRODUCTION TECHNOLOGY

NEIPA (New England India Pale Ale) is a bright, top-fermented beer at 12 to 14°Plato. Hopping was performed only with the Kazbek variety in pellets. Prior to the start of the trial brew, chemical analyses of pelleted hops were performed for the content of alpha acids, beta acids and essential oils.

### Kazbek

Kazbek was selected from hybrid progenies of breeding material with origin in Russian wild hop. Unique flavour hop variety of the Czech origin.



$\alpha$  acids 4,0–7,0 % /  $\beta$  acids 4,0–6,0 % /  $\alpha/\beta$  ratio 0,9–1,5 % / Essential oils 0,9–1,8 g/100g

The results are shown in Table 1:

**Table 1:** Content of alpha and beta acids and content of essential oils

Parameter	Unit	PE 90 Pellets	PE 45 Pellets
Alpha acids	% w/w	6,10	10,06
Beta acids	% w/w	4,09	6,70
Total oils	grams of oil per 100 grams	1,02	1,59
<i><math>\beta</math>-pinene</i>	% rel.	0,84	0,90
<i>myrcene</i>	% rel.	30,6	32,8
<i>limonene</i>	% rel.	0,23	0,26
<i>linalool</i>	% rel.	0,58	0,60
<i>geraniol</i>	% rel.	0,23	0,22
<i>geranyl acetate</i>	% rel.	1,75	1,65
<i><math>\beta</math>-caryophyllene</i>	% rel.	12,0	11,2
<i><math>\alpha</math>-humulene</i>	% rel.	21,4	20,5
<i><math>\beta</math>-farnesene</i>	% rel.	< 0,10	< 0,10



The malt mixture was comprised of pale-ale malt, pilsner malt and wheat malt. Moreover, a fair amount of wheat and oat flakes were used for mashing. The final beer approached 14° Plato.

Only Kazbek hops in PE 45 were used for the first phase of dry-hopping in a whirlpool. The dose of hops was set at 3 grams per litre. The hops were added to the wort after the boil and were steeped there at 80 °C for 30 minutes. The process of main fermentation took place in a cylindrical conical tank at temperature 20 °C.

The second phase of dry hopping was done only with Kazbek PE 45 again. The dose of hop pellets was set at 5 grams per litre. The pellets (in a sterilized bag) were put into the cylindrical conical tank for 3-day steeping. The White Labs P095 (Birlington Ale) in a liquid form were used for the fermentation.

After the main fermentation, the original batch was split and poured into two kegs where the third (last) phase of dry-hopping took place. The dose of hop pellets was set at 7 grams per litre. The batch in the first KEG (Sample I) was dry-hopped by Kazbek hops in pellets PE 90, the batch in the second KEG was dry-hopped with Kazbek pellets PE 45 (Sample II).

The first 3 days, the dry-hopping was exposed to a range of temperature between 11 °C and 12 °C. Next two days, the dry-hopping was exposed to the temperature of 2 °C.

Afterwards, the batches were poured into new KEGs. The KEGs were kept eight days in an ambient with the temperature of 2 °C before bottling.

3 phases of dry-hopping, the dose set at 15 grams per litre in total:

1. phase - 3 g/l PE 45 Kazbek in the whirlpool
2. phase – 5g/l PE 45 in the cylindrical conical tank
3. phase - 7 g/l in KEGs
  - Sample I - 7 g/l PE 90 Kazbek
  - Sample II - 7 g/l PE 45 Kazbek

**Table 2:** Results of chemical analyses of beers

Parameter	Unit	Sample I	Sample II
bitterness	IBU	55,8	55,3
<i>iso</i> -alpha acids	mg/l	28,3	28,0
humulinons	mg/l	4,2	4,5
total polyphenols (% w/w)	mg/l	350	371



## RESULTS AND COMMENTS

For sensory analysis, a comparative test and a triangular test were performed on beer samples. Each of the addressed institutions evaluated the samples separately. Their comments and ratings are described below for each company separately.

### Hop Research Institute

During the sensory seminar, beers were evaluated by the triangular test. Only 4 out of 14 judges identified the identical pair of beers, which means that the differences in the sensory quality of beers are inconclusive. More susceptible individuals who identified the same pair of beers preferred twice sample I and twice sample II.

Sensory evaluation of beers was performed individually and in groups within a sensory seminar (from 2<sup>nd</sup> to 16<sup>th</sup> March 2021).

As part of the individual assessment of beers and the comparative test, **3 judges agreed** on the following evaluation:

Sample I (PE 90) – more intensive aroma, slightly harsher bitterness

Sample II (PE 45) – less intensive aroma, but more pleasant bitterness

Differences in aroma intensity and bitterness quality were recognizable, but not significant. The Beer II was rated better in the overall impression after drinking.

### One judge rated the beers as follows:

Sample I (PE 90) – mild pleasant bitterness, more drinkable compared to the Beer II

Sample II (PE 45) – higher intensity of aroma as well as bitterness, worse drinkability

### Comment:

*"Concentrated PE 45 are a promising product for dry and whirlpool hopping due to the higher content of brewery-valuable substances with a lower proportion of ballast substances. This was reflected, among other things, in minor production losses. The evaluation of beers that were hopped in the in KEG with PE 90 (versus PE 45) showed that the sensory differences in the quality of beers are statistically inconclusive. "*

### Bohemia Hop

The beer was well drinkable, but the differences were slight. In the triangular test, 3 out of 6 judges correctly determined the difference, the preferences were 2: 1 for beers brewed only from PE 45. Lower turbidity and less fullness were observed. A small amount of turbidity was attached to the use of a new type of yeast.



The aroma was pleasant citrus, fruity. The beer, in which PE 90 (Sample I) pellets were used for the last dry hopping, showed grassy tones. The bitterness of the beer, in which only PE 45 pellets were used (Sample II), was very pleasant and clean. In the second sample, the bitterness seemed a little harsher, but the aroma was more pronounced.

*Comment:*

*"One of the original hypotheses that PE 45 reduces the expression of grass tones in the resulting beer has been confirmed.*

*With a significantly lower price of Kazbek against imported hops from the "flavour hops" group, the eventual saved costs are noticeable. With standard NEIPA hopping, the savings on one glass can reach several crowns."*

### **Pioneer Beer Brewery**

In the comparative test (initially tasted only for comparison between Samples I and Sample II) all of the 4 judges preferred a sample of PE 45 only. However, it cannot be said that the second sample was worse. Both samples were very well evaluated.

The sample of PE 45 only had a higher intensity of fruity hop aroma, the aroma profile was cleaner, the bitterness was more balanced, clean with better aftertaste, less bitter. On the other hand, slight turbidity and lower "juicy" character important for NEIPA style were observed.

The triangular test showed that the difference is not so obvious. Only 1 out of the 4 judges identified the difference. In terms of preferences, he was unable to say which was better.

*Comment:*

*"In general, the result pleasantly surprised. Both samples are at a very high level. Such hopped beer would certainly withstand the normal competition of modern styles IPA (NEIPA) "*

### **Máša Brewery**

A total of 4 triangular tests were performed in 3 people. All the judges identified the beers. The preferences were a 1: 1 draw. Sample I appeared softer, with a more pleasant aroma after a short standstill of the poured sample, Sample II was more intense after pouring, with slightly disturbing tones in the aroma after warming (but preference 1: 1).

Citrus (tangerines), woody tones were identified in the aroma and taste, and after warming up. It reminded David Máša of the character of Sorachi Ace hops.

*Comment:*

*"For our brewery, these are very successful beers, which can boldly compete with the US NE IPA in terms of distinctiveness and character. It would certainly be worthwhile to continue working with this form of Kazbek, because something like this was missing in the Czech range. "*



## SUMMARY AND CONCLUSION

All judges rated the prepared beers from a sensory point of view as very good and the Kazbek variety in the form of PE 45 as promising for further production. The Kazbek variety, which belongs to the "flavour hops" group, in the form of PE 45 gives the NEIPA style beer a pleasant pure bitterness and a delicate citrus aroma. On the contrary, it reduces the manifestations of grassy tones, which pass into the beer from ballast substances. This variety is suitable for various styles of top-fermented beers such as NEIPA, IPA, but also for dry hopping of bottom-fermented beers of the IPL style. It can replace or supplement imported varieties from the "flavour hops" group, which are primarily intended for these styles. One of the crucial factors may be the price of hop products and the positive effect of pellets in the form of PE 45 on the reduction of technological losses in the whirlpool.

The differences in the comparative test, in which beers are evaluated individually, were evident with a preference for beer from PE 45. However, the result of the triangular test was inconclusive. Only in the Máša Brewery did all the judges correctly determine the difference.

Overall, the sensory differences were negligible, yet most judges - in terms of drinkability and overall impression - preferred the sample, where 100% Kazbek pellets in the form of PE 45 were used.