



New hop varieties in the Czech Republic

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I. Bitter hops

In 2017 two new hop varieties Gaia and Boomerang were registered. Contents and compositions of hop resins and essential oils are shown in Tables 1 and 2. Gaia originates from Agnus and it was named after the Greek goddess of Earth because of its vigour and very good productivity. Gaia is characteristic for its hoppy and spicy aroma. As it ensues from pilot tests Gaia is suitable not only for the first but for the second hopping as well. Boomerang is also after Agnus. As it is typical by its specific aroma, it can be used as flavour hops too. If added in the form of dry hopping the flavour comes back as a boomerang into a fine aroma of beer. Aroma is intensively spicy and citrusy. Boomerang is suitable for both the first and the second hopping of top fermented ALE, IPA and IBA beers. It can be used in the form of 100 % hopping as well as for cold hopping in these types of beer.

Table 1: Content and composition of hop resins.

Variety	Alpha acids (% w/w)	Beta acids (% w/w)	Alfa/beta ratio	Cohumulone (% rel.)
Gaia	12 - 15	5 - 10	1.3 - 2.7	20 - 29
Boomerang	10 - 14	5 - 10	1.5 - 2.3	27 - 32

Table 2: Content and composition of hop essential oils.

Variety	Content (% w/w)	Myrcene (% rel.)	Caryophyllene (% rel.)	Farnesene (% rel.)	Humulene (%rel.)	Selinene (% rel.)
Gaia	1.5 - 2,5	23 - 37	9 - 12	5 - 7	2 - 4	25 - 27
Boomerang	1.5 - 3.0	30 - 53	7 - 11	0.4 -1.0	17 - 24	1 - 2



II. Aroma hops

Average values from chemical analyses of hop resins obtained in 2018 are shown in Table 3. All genotypes have lower ratio of cohumulone, which is a very important brewing characteristic. The best results show genotypes 4801, 4979, 5045 and 5227. As genotypes 5045 and 5227 had the highest yield they were planted in another hop garden so as to be submitted to other research. In 2017 we managed to harvest sufficient number of hops for chemical analyses and trial brews in our pilot brewery and other breweries in CR. Susceptibility to agrotechnical operations needed for successful growing of these hops is found out within field trials in practical conditions of hop gardens.



Table 3: Average yield, composition of hop resins and ration of farnesene in the period since 2013 till 2018.

Genotype	Yield (t.ha-1)	Alpha acids (% w/w)	Beta acids (% w/w)	Cohumulone (% rel.)	Farnesene (% rel.)
4801 Saaz Brilliant	2.7	4.1	4.0	26	12
4975 Saaz Comfort	2.8	6.4	6.5	18	15
5045 Saaz Shine	2.8	3.7	3.8	24	12
5227 Mimosa	2.8	2.4	7.6	31	1



Registration of new aroma varieties is supposed in 2019. We expect interest of brewers not only from Czech but all over the world as well.

III. Dwarf hops

In the period since 2014 till 2017 twelve best genotypes entered registration trials. Country and Jazz were the most productive with the average yield of 1.5 t/ha. Good yield of 1.3 t/ha showed genotype N3 (Blues). Commercial assessments, carried out in all these genotypes, were aimed at aroma, overall appearance and damage caused by downy and powdery mildew. None of them showed damage caused by these fungal diseases. Genotypes with the highest variability in the content and composition of hop resins and essential oils were chosen for brewing tests because of sensoric variability in beers. Therefore, we can recommend them for the third hopping. Country shows higher sensory bitterness with pleasant dying away. Therefore, they are suitable for the second and third hopping. Very interesting are genotypes Blues and Jazz, which are characteristic by their specific aroma. They bring spicy and fruity flavours into beer.



Table 4: Average yield, composition of hop resins and ratio of farnesene in the period since 2014 till 2018.

Genotype	Yield (t/ha)	Alpha acids (% w/w)	Beta acids (% w/w)	Cohumulone (% rel.)
Blues	1.3	7.6	4.1	26
Country	1.5	3.2	2.1	27
Jazz	1.5	4.2	2.2	32

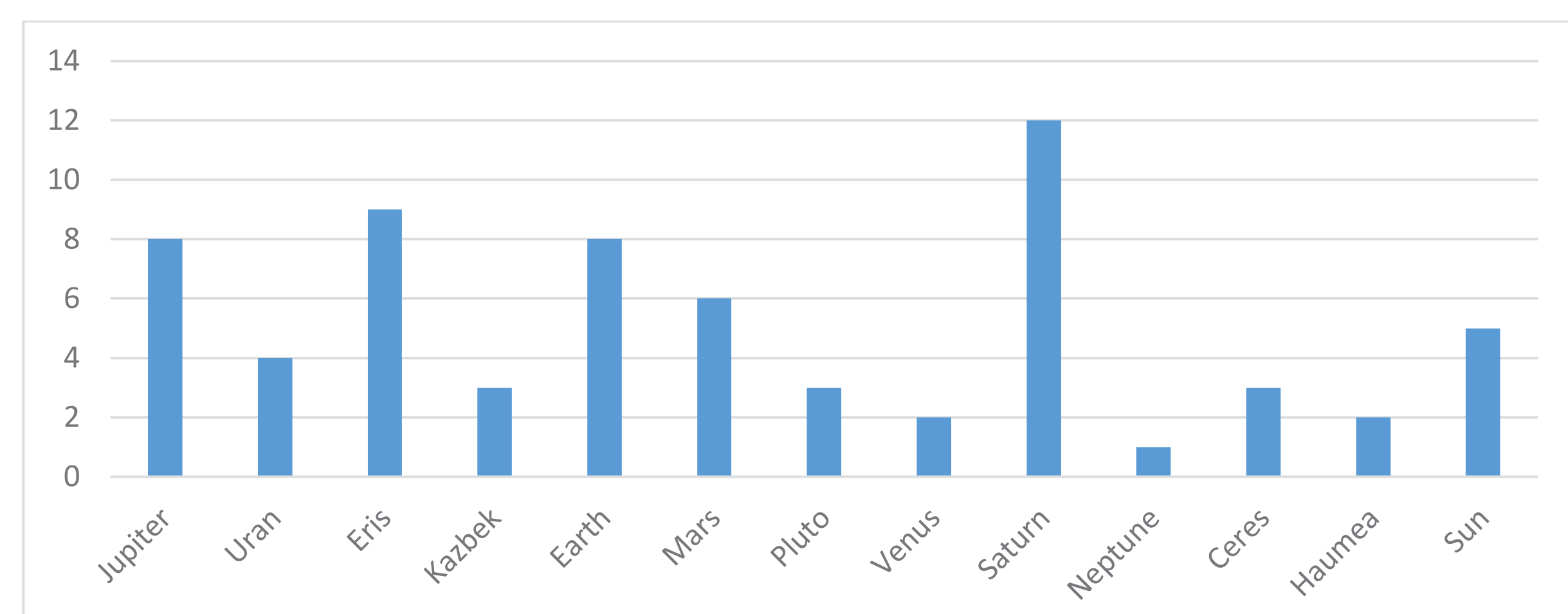


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IV. Flavour hops

Selected samples were used for cold hopping when ALE type of beer was brewed. Agnus and Kazbek were used for the first hopping. Ground cones of the individual tested genotypes in the dose of 3.0 g/L, added ten days before bottling, were used for dry hopping. Twenty-three brew masters evaluated the beers. Kazbek was used as a reference sample within citrusy flavours. It is obvious from Figure 1 that genotypes Eris and Jupiter were the most favourite ones within citrusy aromas. Floral flavours were not as distinctive as citrusy ones. Therefore, the tasters preferred Earth genotype because of its intensive floral aroma. Among fruity types Saturn was the most favourite one, even though it is not unambiguous. Sun genotype was the best within the last group. All the tasters have agreed that it is very suitable for IBA production. We can say that each genotype is interesting for its specificity. We can demonstrate it in the group of fruity flavours.

Figure 1: Preference of genotypes used for dry hopping



Perspective genotypes with aroma different from Kazbek are in registration trials at present (Tables 5 and 6). Other crossings were carried out and the obtained genotypes are typical by their interesting specific aromas.

Acknowledgement

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Table 5: Perspective genotypes with specific aroma.

Genotype	Yield (t/ha)	Alpha acids (% w/w)	Beta acids (% w/w)	Cohumulone (% rel.)	Aroma
5193 (Venus)	2.1	8.3	4.3	30	Medium fruity and citrusy.
5164 Uran	2.8	12.6	5.6	24	Strong spicy.

Table 6: New perspective genotypes with specific aroma.

Genotype	Alpha acids (% w/w)	Beta acids (% w/w)	Cohumulone (% rel.)	Smell	Origin
5495 (Juno)	4.0 - 5.5	4.0 - 4.5	39 - 45	Sweet	Kazbek x wild hop Canada (180)
5512 (Ceres)	6.5 - 8.5	3.0 - 4.5	35 - 43	Citrus, herbal	Kazbek x BM (Czech, European origin)
5520 (Saturn)	6.0 - 8.5	3.5 - 4.5	40 - 52	Sweet, tropical	Kazbek x BM (European origin)
5540 (Jupiter)	4.0 - 7.0	2.5 - 3.5	28 - 32	Citrusy, woody	Kazbek x BM (US, European origin)
5571 (Eris)	7.0 - 9.0	5.0 - 6.5	30 - 36	Citrus	Kazbek x Old BM (Fuggles)
5580 (Pluto)	5.5 - 6.5	4.5 - 5.5	19 - 25	Fruity	Harmonie x (Saaz x Saaz)