

Versuchs- und Lehranstalt für Brauerei in Berlin e. V., Seestr.13, 13353 Berlin

Petainer Czech Holdings s.r.o.

Skandinávská 2
CZ - 352 01 Aš
Czech Republic

**Brewing & Beverage
Science and Applications
(BBSA)**

Patrícia Diniz
MSc. Chemical Engineer

Tel.: +49-30-45080-149

Fax: +49-30-45080-288

E-Mail: diniz@vlb-berlin.org

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Dear Mr. Hartwig,

In compliance to your request to the VLB Berlin of several series of sensory evaluations for comparison of PET and Metal Keg containers, you can find below the results of the complete trial of nine months of storage.

Conclusion of the trial:

In the table below the results of the entire period of trials are summarized for a clearer overview. Apart from the sour impression felt in some of the beers (probably due to contamination), in the complete trial of 9 months the development of the different beers tested was generally similar when stored in metal and in PET Kegs, leading to the conclusion that both types of Kegs have similar performance along the storage time.

We hope we fulfilled your expectations and that these results can help you characterize the analyzed containers. We are available to continue supporting and working in collaboration with Sauer & Hartwig.

With kind regards,



Patrícia Diniz



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Table 1 – Results of the sensory evaluation during a 9 month period of storage.

| Type of beer | Time of storage | | | | |
|---|------------------------------|----------|----------|------------------------------|---|
| | zero value | 3 months | 6 months | 9 months | additional comments |
| Märzen | No | No | No | No | - |
| Pils | No | No | No | No | - |
| Klosterbock | No | No | No | No | - |
| Kölsch | No | No | No | No | - |
| Weisse CO₂ vs. Luft | No | - | - | - | This beer was only planned for tasting one single time. |
| Ale | No | No | No | No | - |
| Weizen über KZE | Yes ($\alpha = 0,01\%$) | No | No | No | - |
| Weizen mit Nachgärung im Keg | No | No | No | Yes ($\alpha = 0,05\%$) | The beer in PET keg was described as slightly oxidized after 9 months of storage. |

Remarks:

Yes – overall the panel of tasters found a significant difference between the samples.

No – no difference was detected between the samples.

* – the evaluation of this beer was interrupted due to acidity impression.



Table 2 – Comments on the sensory evaluation.

| Type of beer | zero value | | 3 months | | 6 months | | 9 months | |
|---------------------------------------|--|-------------|--|---------|--|---------|--|-------------|
| | Comments | Tasters | Comments | Tasters | Comments | Tasters | Comments | Tasters |
| Märzen | <ul style="list-style-type: none"> Beer in PET less fresh Beer in PET less aromatic | 2 1 | <ul style="list-style-type: none"> Beer in PET sweeter Beer in PET w/ better hops aroma | 1 1 | <ul style="list-style-type: none"> Beer in PET slightly sour Beer in Metal fresher | 2 2 | <ul style="list-style-type: none"> Beer in PET and in Metal sour, with lactic acid impression | 5 |
| Pils | <ul style="list-style-type: none"> Beer in PET w/ slightly more caramel and coffee taste | 2 | <ul style="list-style-type: none"> Beer in Metal w/ less intense malt odour Beer in Metal slightly older | 1 2 | <ul style="list-style-type: none"> No comments | - | <ul style="list-style-type: none"> Hardly any differences between the beers Beer in Metal w/ more carbonation | 10 1 |
| Klosterbock | <ul style="list-style-type: none"> Beer in PET w/ less CO₂ Beer in PET w/ cardboard flavour Beer in PET more estery and watery | 1 1 1 | <ul style="list-style-type: none"> Beer in Metal more estrey | 1 | <ul style="list-style-type: none"> Beer in Metal more esterfull | 1 | <ul style="list-style-type: none"> The tasters reported difficulties in finding differences between the two beers | 3 |
| Kölsch | <ul style="list-style-type: none"> Beer in PET w/ fruity aroma Beer in PET fresher Beer in PET w/ hint of H₂S | 1 1 1 | <ul style="list-style-type: none"> Beer in Metal slightly more aged | 2 | <ul style="list-style-type: none"> Beer in Metal less carbonated Beer in Metal w/ slightly unpleasant bitterness | 1 1 | <ul style="list-style-type: none"> Beer in PET w/ cardboard aroma Beer in PET w/ less CO₂ Beer in Metal bready | 1 1 1 |
| Weisse CO₂ vs. Luft | <ul style="list-style-type: none"> No comments | - | - | - | - | - | - | - |



| Type of beer | zero value | | 3 months | | 6 months | | 9 months | |
|-------------------------------------|---|---------------------|--|------------------------------|---|------------------------------|---|------------------------------|
| | Comments | Tasters | Comments | Tasters | Comments | Tasters | Comments | Tasters |
| Ale | <ul style="list-style-type: none"> Beer in PET less bitter | 2 | <ul style="list-style-type: none"> Beer in Metal w/ milder taste | 2 | <ul style="list-style-type: none"> No comments | - | <ul style="list-style-type: none"> Beer in PET w/ slight impression of old hops Beer in Metal fresher and more intense in odour and taste | 2 1 |
| Weizen über KZE | <ul style="list-style-type: none"> Beer in PET w/ slight sour smell Beer in PET w/ musty taste | 1 1 | <ul style="list-style-type: none"> Beer in PET slightly less fresh Beer in PET w/ less fizziness Beer in PET w/ banana aroma Beer in PET w/ slightly solvent odour | 3 3 1 1 | <ul style="list-style-type: none"> Beer in PET slightly less fresh Beer in PET lower CO₂ content Beer in KEG more balanced | 1 1 1 | <ul style="list-style-type: none"> The tasters reported difficulties in finding differences between the two beers | 3 |
| Weizen mit Nachgärung im Keg | <ul style="list-style-type: none"> Beer in Metal fruity with banana aroma Beer in Metal sweeter Beer in PET less intensive taste | 2 2 2 | <ul style="list-style-type: none"> Beer in Metal w/ more intense fruity odour Beer in Metal more watery Beer in PET w/ hop notes missing | 1 1 1 | <ul style="list-style-type: none"> Beer in Metal w/ slight yeast taste Beer in Metal w/ solvent aroma Beer in Metal w/ more CO₂ content Beer in PET more pleasant / balanced | 1 1 1 1 | <ul style="list-style-type: none"> Beer in Metal less fruity Beer in Metal less balanced Beer in Metal w/ more CO₂ Beer in PET slightly oxidized | 2 1 1 2 |