Application of Temporal Dominance of Sensation in the Evaluation of Different Kinds of Beer

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Background:

Today there exists an increased demand under consumers for alcohol reduced and alcohol free beer worldwide. The reasons for this higher consumption are different: reduced intake of energy or ethanol, religious rules, driving a car or living a sporty and healthy lifestyle are some examples. However, there are some differences in the flavour characteristics of low alcoholic beer compared to alcoholic beer, such as a potato-like worty off-flavour or even the lack of desirable flavours like fruity.

Material and Methods:

In the present study the dominances of five flavour attributes (bitterness, astringency, fruity, malty and worty off-flavour) and their changes over the whole time of analysis (100 sec.) of three alcoholic, alcohol reduced and alcohol free beers, respectively, produced by three Austrian breweries (*Egger*, *Stiegl* and *Zipfer*) were evaluated by using Temporal Dominance of Sensations (TDS), a dynamic sensory method.

Results:

The TDS-curves showed differences in attribute dominance depending on the ethanol content of the samples. It was shown, that dominance of bitterness (Fig. 1) and astringency were connected to ethanol content.
The undesirable worty off-flavour was most pronounced in alcohol free beers, the dominance duration was significantly ($p < 0,05$) higher than in alcoholic beers (Fig. 2).
However, worty off-flavour dominated not the complete time of analysis (100 sec.), there were also desirable attributes dominant like bitterness or malty flavor.
In alcohol reduced beer, fruity flavour was more dominant than in all other samples (Fig. 3) and the worty off-flavour was less dominant than in alcohol free samples. Dominance Duration of worty off-flavour in alcohol reduced beer was not in all samples significantly ($p < 0,05$) different from alcoholic beer samples (Table 1).

Conclusion:

Based on the presented results currently produced alcohol reduced beers provide a way to limit the consumption of ethanol without having to give up the pleasure of taste quality beer.
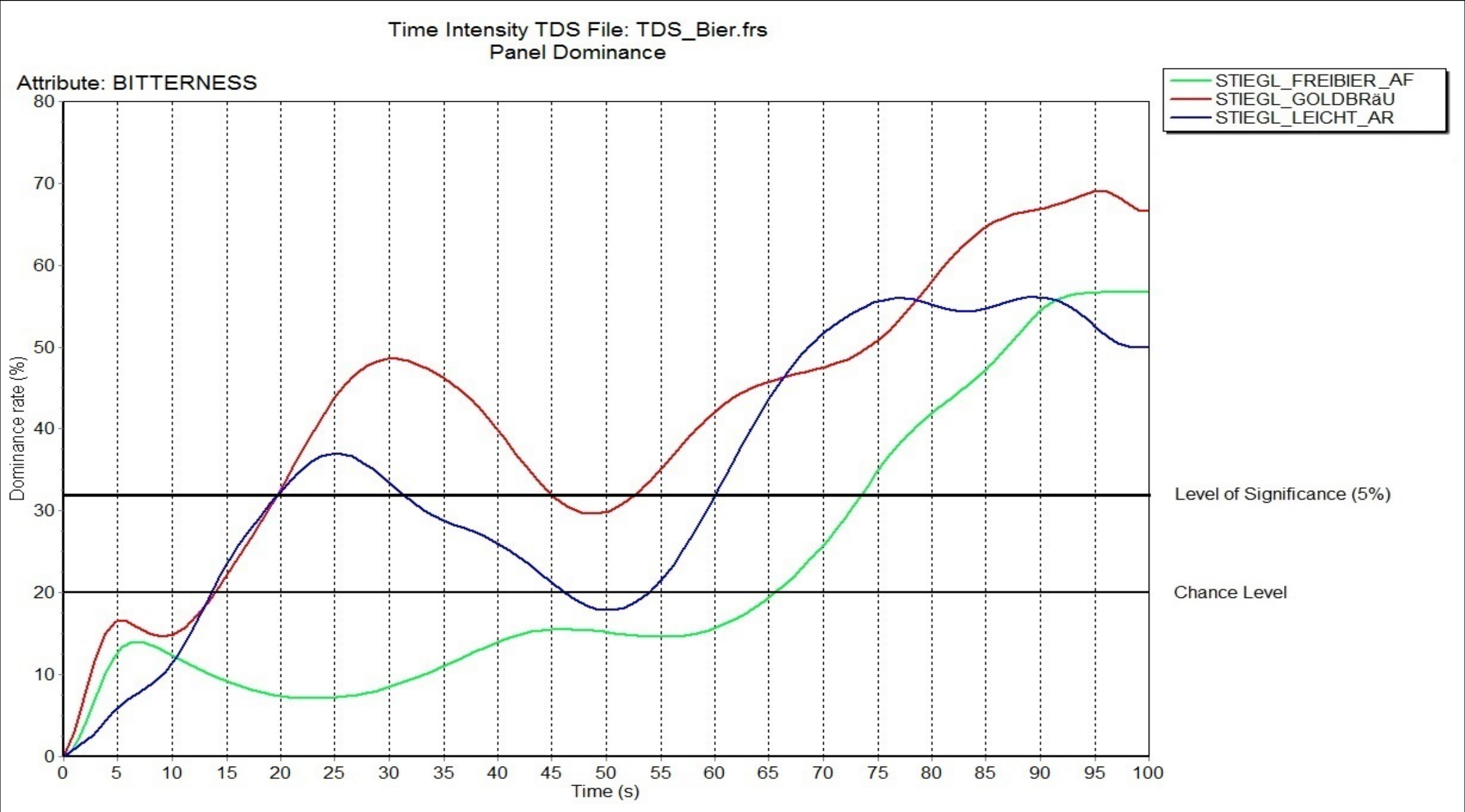

Figure 1: : TDS-profile for the attribute *"bitterness"* of the three analysed *Stiegl*-beers with different ethanol content.
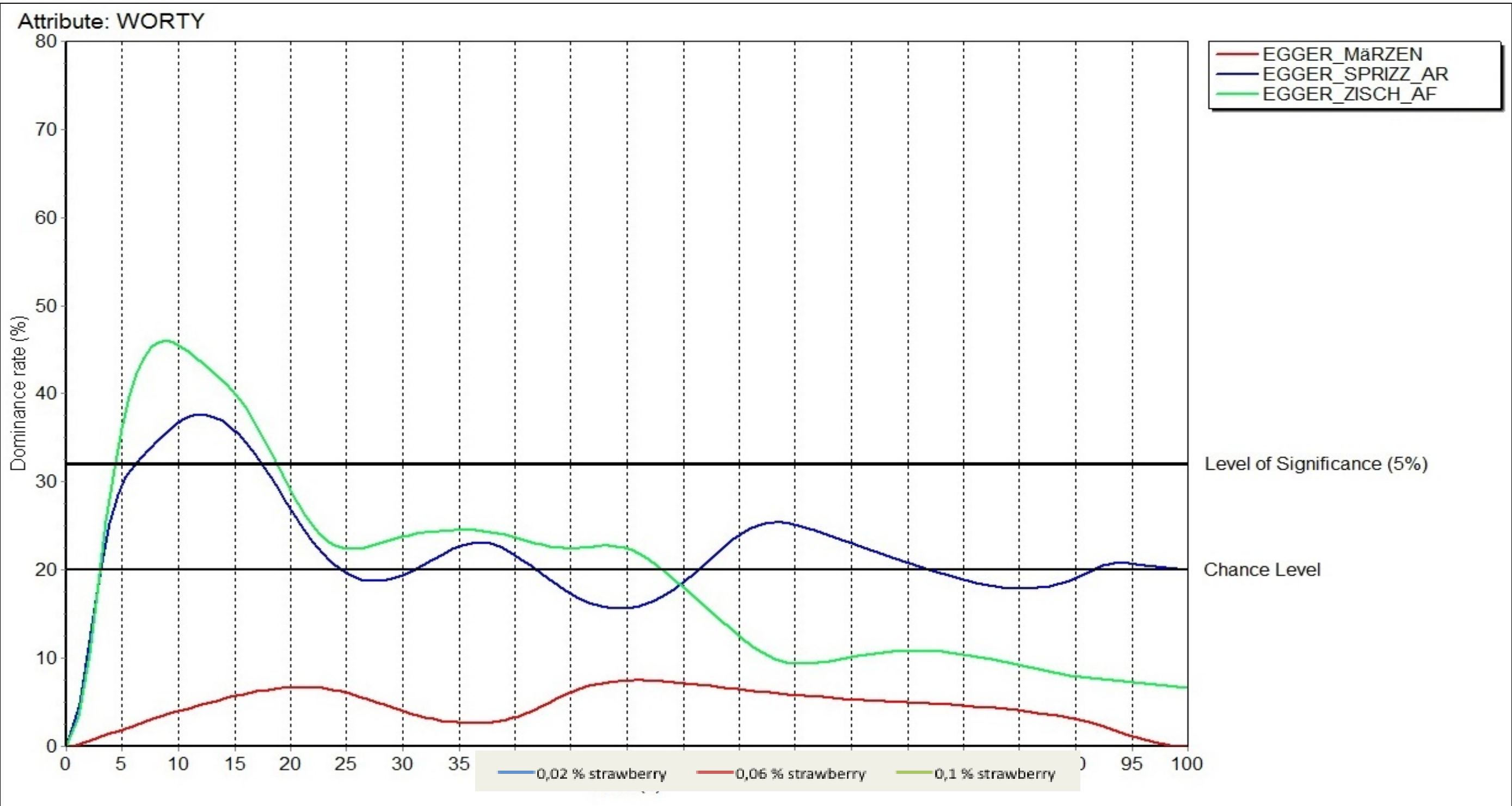

Figure 2: TDS-profile for the attribute *"worty off-flavour"* of the three analysed *Egger*-beers with different ethanol content.
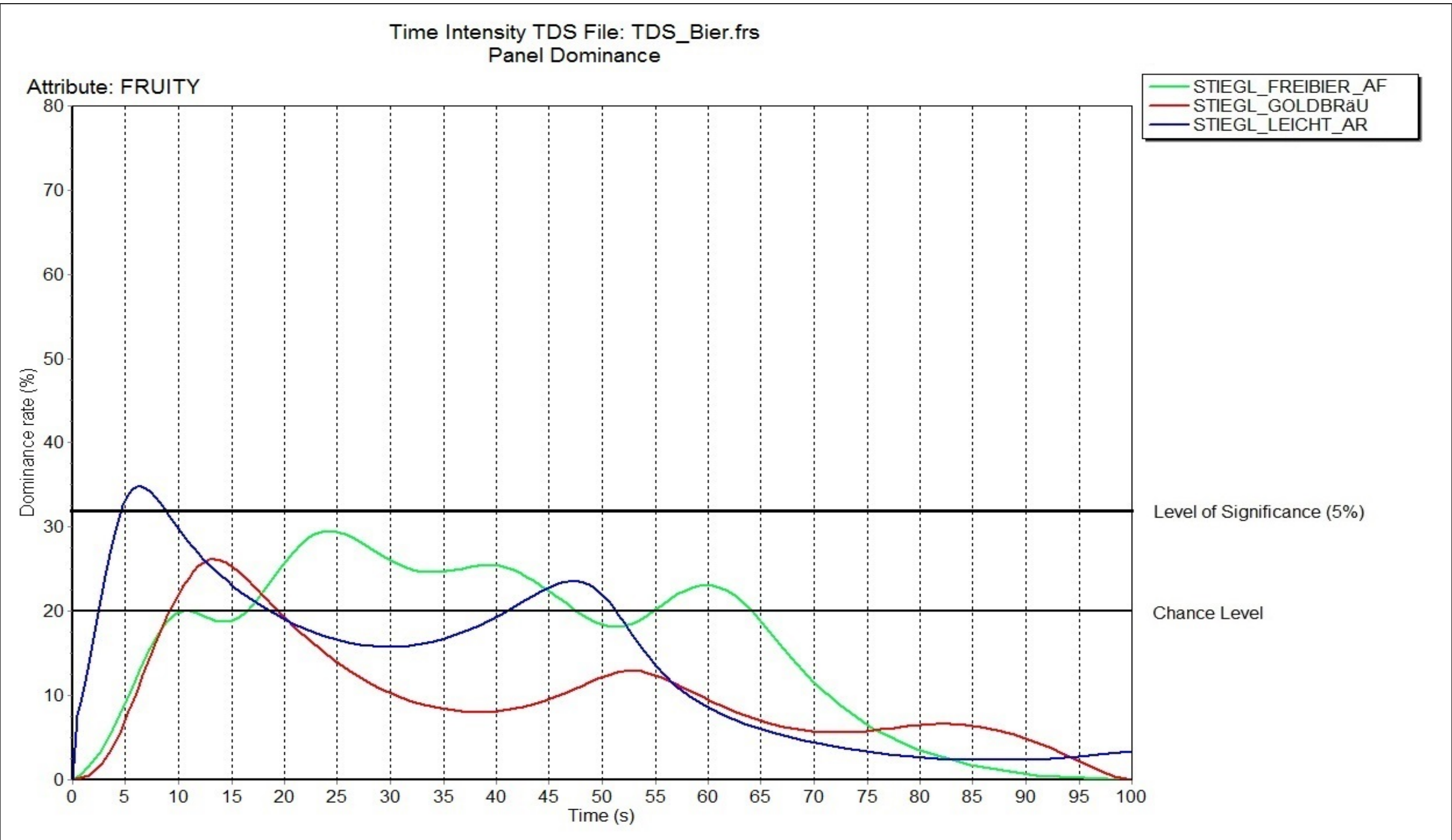

Figure 3: TDS-profile for the attribute *"fruity"* of the three analysed *Stiegl*-beers with different ethanol content.

Multiple Comparisons

bound variable: Worty

Bonferroni

(I)Bierprobe	(J)Bierprobe	mean difference	Standarderror	Sig.	95%- confidence interval upper limit	lower limit
ZIPFER_3_AR	ZIPFER_HELL_AF	-9,1667	5,31775	,265	-22,1481	3,8148
	ZIPFER_URTYP	12,3000	5,31775	,069	-,6814	25,2814
ZIPFER_HELL_AF	ZIPFER_3_AR	9,1667	5,31775	,265	-3,8148	22,1481
	ZIPFER_URTYP	21,4667*	5,31775	,000	8,4852	34,4481
ZIPFER_URTYP	ZIPFER_3_AR	-12,3000	5,31775	,069	-25,2814	,6814
	ZIPFER_HELL_AF	-21,4667*	5,31775	,000	-34,4481	-8,4852

Basis: observed means
error term is mean squares(error) = 424,177
*the mean difference is significant at the 0.5-level

Table 1: Comparison of the "Dominance Duration" of the worty off-flavour in *Zipfer*-beers with different alcohol content