

## COLLABORATIVE DETERMINATION OF BEER FOAM STABILITY BY RUDIN AND NIBEM

SUBMITTED ON BEHALF OF THE ANALYSIS COMMITTEE OF THE INSTITUTE OF BREWING BY F. R. SHARPE

**Two methods, the “Rudin” method and the “Nibem” method have been tested for the determination of foam stability of beer by the Analysis Committee of the Institute of Brewing.**

**For the Rudin method, over the range 90 to 102 seconds, it was judged that precision values were independent of the foam stability of the sample. Values for  $r_{95}$  and  $R_{95}$  were 6 and 22 seconds, respectively.**

**For the Nibem method, precision was also independent of the foam stability of the sample over the range 213 to 246 seconds. Values for  $r_{95}$  and  $R_{95}$  were 22 and 70 seconds, respectively.**

**The two methods ranked the foam stability of the three beers tested differently. This is to be expected, bearing in mind the different principles of the two procedures.**

*Key Words: Foam stability, head retention, Nibem, Rudin, beer (analysis method for), collaborative test.*

The Analysis Committee of the Institute of Brewing (IOB) appointed the following sub-committee to determine the precision of a method for the determination of foam stability of beer: A. P. Mundy (Chairman), H. Border, G. K. Buckee, M. Fogg, R. Kennedy and J. Byrne.

The sub-committee wish to thank Mr N. Boley of the Laboratory of the Government Chemist for his help in organising the collaborative test.

### INTRODUCTION

No method is currently recommended by the Institute of Brewing for the determination of beer foam stability. The Analysis Committee decided to prepare and collaboratively test two methods which are widely used within the brewing industry, namely the Rudin and the Nibem, for possible inclusion in the IOB Methods of Analysis.

### EXPERIMENTAL

The organisation of the collaborative trial and the statistical treatment of the data were carried out according to the procedures given in the International Standard ISO 5725<sup>2</sup>. A uniform design was employed and 3 samples of beer were distributed to 20 laboratories. Participants were requested to determine the foam stability of the samples, in duplicate, by either the Nibem or Rudin methods. A copy of each method was supplied. Participants were requested to indicate whether the Manual or Auto Rudin method had been employed. Ten laboratories returned results for the Nibem method and 12 results were returned for the Rudin method. Only one of these participants indicated that they had used the auto Rudin apparatus and therefore their results were excluded from the test, there being insufficient data to calculate the precision for the auto Rudin method.

### RESULTS AND DISCUSSION

Raw data as received are presented in Table I. No outliers or stragglers were identified, therefore no results were excluded. For the Rudin method, over the range 90 to 102 seconds, it was judged that precision values were independent of the foam stability of the sample. Values for  $r_{95}$  and  $R_{95}$  were 6 and 22 seconds, respectively.

For the Nibem method, precision was also independent of the foam stability of the sample over the range 213 to 246 seconds. Values for  $r_{95}$  and  $R_{95}$  were 22 and 70 seconds, respectively.

The Rudin method has slightly better repeatability and reproducibility than the Nibem method.

In terms of the ability of the methods to predict whether a

TABLE I. Raw data

Manual Rudin Results in seconds						
Lab No:	Beer 1		Beer 2		Beer 3	
1	109	108	106	106	100	102
2	108	106	114	110	100	94
3	92	95	95	95	87	86
4	98	95	105	104	87	89
5	92	91	96	93	85	83
6	102	102	102	108	100	91
7	95	93	98	96	83	85
8	115	115	116	115	94	97
10	89	92	89	90	77	83
12	99	101	102	102	91	90

Nibem  
30 mm collapse time—results in seconds

Lab No:	Beer 1		Beer 2		Beer 3	
9	209	205	225	214	215	211
10	173	172	216	207	198	191
11	200	216	259	261	247	247
12	211	209	226	234	210	202
13	183	184	187	206	197	208
14	209	210	238	233	232	254
15	234	246	279	267	264	276
16	245	252	274	289	277	256
17	203	223	278	258	244	242
18	223	224	264	262	247	235
19	213	225	258	258	247	255
20	231	215	244	256	239	246

TABLE II. Ranking

% of participants ranking each beer according to the measured foam performance

Rudin			
	Beer 1	Beer 2	Beer 3
Best	10%	90%	zero
Middle	90%	10%	zero
Worst	zero	zero	100%

Nibem			
	Beer 1	Beer 2	Beer 3
Best	zero	82%	18%
Middle	9%	18%	73%
Worst	91%	zero	9%

beer has satisfactory foam stability a comparison with actual foam stability was not assessed in the collaborative trial. There does, however, appear to be a difference between the two methods in their assessment of foam stability. Both methods

TABLE III. Precision

Nibem Results in seconds			
	Beer 1	Beer 2	Beer 3
n	10	10	10
Mean	213	246	235
r(95)	21	23	23
R(95)	61	77	73

  

Manual Rudin Results in seconds			
	Beer 1	Beer 2	Beer 3
n	11	11	11
Mean	100	102	90
r(95)	4	6	8
R(95)	23	24	20

Precision summary  
Results in seconds

	Nibem	Rudin
Level	213–246	90–102
n	10	11
r(95)	22	6
R(95)	70	22

ranked Beer 2 to have the best foam stability. However, whilst Beer 3 was unanimously ranked to have the poorest foam of the 3 beers by the Rudin method, this was not the case for the Nibem method, where the majority of participants (10 out of 11) found that Beer 1 had the poorest foam stability.

The discriminating ability of the methods is also different. In the Rudin method only one participant ranked the beers differently. For the Nibem method the ranking of the beers was not as unanimous. Only 82% (9 out of 11) participants ranked Beer 2 with the best foam, whilst Beer 3 was ranked best by 2 participants, and worst by 1 participant, the majority (8) ranking it in the middle.

These differences are probably accounted for in the fundamental difference in the principles of the 2 methods. In the Rudin method, the beer is degassed and therefore any inherent foam enhancing properties of the dissolved gas is lost. Also the drainage of beer from the foam is measured in a tube with a large surface area to volume ratio, thus surface tension effects may exert a greater effect on the measurement obtained. In the Nibem method the beer is dispensed in a way more representative of actual dispense conditions, albeit with a disproportionate amount of foam, but with dissolved gases retained.

## CONCLUSIONS

The precision of both the Rudin and the Nibem methods was considered satisfactory and these methods are recommended for inclusion in IOB Methods of Analysis.

## REFERENCES

1. Institute of Brewing, *Recommended Methods of Analysis*, 1991, Method 8.5.
2. Precision of test methods—Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests, ISO 5725, 1986.