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The influence of acetaldehyde and water on the determination of ^{14}C in wine alcohol

by

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Der Einfluß von Acetaldehyd und Wasser auf die ^{14}C -Bestimmung bei Weinalkohol

Zusammenfassung. — Die Bestimmung von ^{14}C im Äthanol von Wein wird nicht signifikant beeinflusst, wenn die Destillation sorgfältig durchgeführt wird und der Wasser- und Aldehyd Gehalt 10% (v/v) bzw. 0,5% (v/v) nicht übersteigt.

The determination of ^{14}C in wine alcohol has lately been used to examine wines for the probable presence of synthetic ethanol (cf. SIMON *et al.* 1968). For this purpose the ethanol is distilled from the wines and relatively involved chemical procedures applied to remove i.a. water and aldehydes to prepare the ethanol for ^{14}C determination (L'ORANGE and ZIMEN 1969). The influence of these latter components on counting efficiency was investigated in an attempt to circumvent the cleaning procedure which was time-consuming, especially when many samples have to be analysed.

1. Influence of water content of ethanol on counting efficiency

In Table 1 it is shown from external standard ratio values that no marked quenching occurred at water contents up to 13,3 % (v/v). However, counting efficiency decreased when water contents exceeded 5 % (v/v). This decrease is relatively small and can be ignored for all practical purposes up to water contents of 10 % (v/v) i.e., at alcoholic strengths higher than 90 % (v/v).

Table 1

Effect of water content of ethanol on counting efficiency and quenching
Einfluß des Wassergehaltes von Äthanol auf Zählansbeute und Quench

Water content in ethanol vol. %	Counting efficiency %	External standard ratio ¹⁾
0	79,6	0,652
2,0	79,6	0,651
5,3	80,0	0,655
7,1	78,9	0,642
10,3	77,9	0,647
13,3	76,6	0,647

¹⁾ External standard ratio value of $0,650 \pm 0,008$ corresponded to a counting efficiency of 80 %; all samples having this value and higher were regarded as unquenched.

2. Influence of acetaldehyde content of ethanol on counting efficiency

Acetaldehyde, added to ethanol in volumes from 0 to 2,0 % (v/v), showed appreciable quenching and counting efficiency decreases at concentrations in excess

Table 2

Effect of acetaldehyde content of ethanol on counting efficiency and quenching
Einfluß des Acetaldehydgehaltes von Äthanol auf Zählausbeute und Quench

Aldehyde content in ethanol vol. %	Counting efficiency %	External standard ratio ¹⁾
0	78,8	0,649
0,1	78,7	0,650
0,3	78,0	0,641
0,5	77,7	0,626
1,0	76,8	0,599
2,0	74,6	0,567

¹⁾ External standard ratio value of $0,650 \pm 0,008$ corresponded to a counting efficiency of 80 %; all samples having this value and higher were regarded as unquenched.

of 0,5 % (v/v) (Table 2). However, acetaldehyde values of this magnitude are not obtained in ethanol from wines if a careful distillation procedure is used (L'ORANGE *et al.* 1968). Consequently acetaldehydes do not affect counting efficiency under these conditions.

Samples of wines were distilled by means of a 2 m long fractionating column filled with Berl saddles and a reflux ratio of approximately 1 : 8. Approximately 60 cm³ ethanol of between 92—96 % (v/v) was obtained from 750 cm³ wine. Under these conditions neither the water nor the aldehyde content influenced the counting efficiency significantly and it was therefore not necessary to remove these components prior to ^{14}C analysis.

Literature

- L'ORANGE, R. und ZIMEN, K. E., 1969: Zeitliche Verteilung (1952—1967) des bei Kernwaffenversuchen entstandenen C-14. *Radiochimica Acta* 11, 145—149.
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