Methodology

Aflatoxins in peanut meal

The following report was prepared and submitted by R. Battaglia and W. Steiner of the Kantonales Labor Zurich, Postfach 8030, Zurich, Switzerland. The report, showing the effects of solvent systems and solvent ratios on aflatoxin B1 and G1 analytical values of Smalley peanut meal samples, is based on a study performed by Battaglia and Steiner.

We have taken part in the Smalley Aflatoxin Series for peanuts since 1984. Because the difference between our results and the mean results of all laboratories has steadily widened (except for the standard solution, marked in black in Figure 1), we would like to discuss briefly our observations with respect to the extraction of aflatoxins from peanut meal.

Our extraction procedure originally corresponded to the official Swiss Method *(Mitt. Geb. Lebensmittelunters. Hyg. 73*:362, 1982). Under this method, 40 g peanut meal, 100 ml methanol and 10 ml water are put into a blender and the mixture is homogenized for three minutes. After the addition of 30 ml water, the slurry is again homogenized for three minutes. The mixture is filtered through a fluted filter paper and 70 ml filtrate is collected and transferred into a separatory funnel. Water (20 ml) and dichloromethane (90 ml) are added, the mixture is shaken, the organic phase is drained off and dried with anhydrous sodium sulfate, and the solvent is evaporated on a rotary evaporator (ca. 20 Torr, 40°C).

In the period 1985/1986, our analysis of sample 5 delivered a remarkably higher result than the mean value of all laboratories (137 vs. 82.2 ng aflatoxin B1/g peanut meal, Figure 1, number 13). We then reanalyzed the sample using 5 g and 2 g of meal (instead of 40 g), keeping the rest of the analysis unchanged. The concentrations found were 224 and 256 ng/g.

After that, we used 10 g of meal instead of 40 g (Figure 1, number 17, 1986/1987). Aflatoxin contamination of the samples was high enough to allow this reduction of meal for analysis. The consequence was an increase in the difference between our results and the mean of all laboratories (Figure 1).

In the course of further analyzing peanut meal, we noted a publication by Whitaker et al. [*J. Assoc. Off. Anal. Chem. 69(3):508, 1986*] suggesting a concentration of 60% methanol and a solvent-to-peanut ratio of 10.8 as optimum for aflatoxin extraction from peanuts. Reanalyzing sample 5 (1986/1987, Fig. 1, number 21, our result: 74; mean result: 40.8 ng aflatoxin B1/g) gave the concentrations shown in Table 1.

It seems that the conditions proposed by Whitaker et al. are not optimum for our analytical procedure and that defatted peanut meal may probably require yet another solvent-to-sample ratio.

In order to estimate the influence of that ratio, samples 3 and 4 (1987/1988, Figure 1, numbers

TABLE 1

Reanalysis of Sample 5

Solvent/sample ratio	Methanol in water (%)	Aflatoxin (ng/g) B1	Aflatoxin (ng/g) G1
70	71.4[a]	73	9
28	71.4[a]	73	11
14	71.4[a]	61	9
10.8[b]	60[b]	45	7
10.8[b]	60[b]	52	8

[a]Final concentration.
[b]Solvent-to-sample ratio and methanol concentration according to Whitacker et al., but using analytical procedure of Battaglia and Steiner.

TABLE 2

Varying Solvent-to-Sample Ratios

Sample number	Sample (g)	Solvent (ml)	Ratio	Aflatoxin (ng/g)[a] B1	Aflatoxin (ng/g)[a] G1
3[b]	20	70	3.5	96	27
	20	140	7	117	34
	10	140	14	147	31
	5	140	28	134	40
	2	140	70	153	45
	1	140	140	143	32
4[c]	20	70	3.5	93	27
	20	140	7	130	36
	10	140	14	136	38
	5	140	28	157	40
	2	140	70	159	37
	1	140	140	166	28

[a]Mean of two determinations.
[b]Mean of Smalley results and value obtained by Battaglia and Steiner—aflatoxin B1: 78.6 and 140, respectively; aflatoxin G1: 32.2 and 26 ng/g.
[c]Mean of Smalley results and value obtained by Battaglia and Steiner—aflatoxin B1: 77.2 and 136, respectively; aflatoxin G1: 32.7 and 38 ng/g.

27 and 28) were analyzed by varying the solvent-to-sample ratio. The results are shown in Table 2.

The efficiency of the extraction was obviously dependent on that ratio. Furthermore, it appears that the extraction behavior of aflatoxin B1 and G1 were slightly different (Figure 2). According to these results, an optimum solvent-to-sample ratio would be about 30.

We realize that the few results presented do not allow us to arrive at a more precisely defined optimum ratio, but in our opinion, it is advisable to reevaluate the various methods employed as to their extraction efficiency. It is highly probable that various foods show a different adsorption behavior toward aflatoxins and that a good extraction efficiency demands a different approach on a case-by-case basis.

We would be very interested to obtain comments from fellow analysts.

Turbidimetric course

Hach Co. is offering a training course on "Turbidimetric Measurement of Phospholipids and Waxes in Vegetable Oil." The course will be held at the Hach Technical Training Center in Loveland, Colorado, Jan. 26-27, 1989. For more information about the workshop, contact Tom Aspelund, Hach Co., PO Box 389, Loveland, Colorado 80539, telephone 303-669-3050.

Correction

The Smalley Check Sample Program analyses for 1985-86, published in *JAOCS* in September 1988, contained three errors in the footnotes to Table 15. The units mg/kg noted in footnotes a, c and e in Table 15 on page 1435 should read ug/kg (ppb).

Methods

The 4th Edition of AOCS Methods will be available during 1989. Information was mailed to subscribers of **Additions and Revisions** in November. For further information, contact Dave Berner, AOCS Technical Director, PO Box 3489, Champaign, IL 61821-0489.

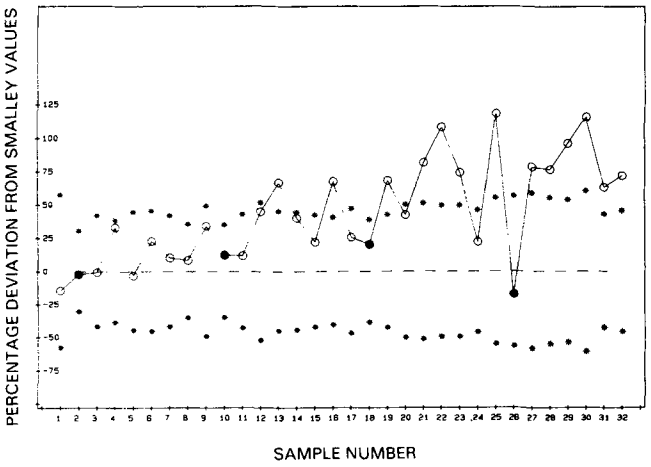

FIG. 1. Smalley Check Samples, Aflatoxin B1. Note: ○ % Deviation of Battaglia and Steiner's results from the mean of the Smalley values for samples; ● % Deviation of Battaglia and Steiner's results from the mean of the Smalley values for standards; and * Coefficient of variation for all results.

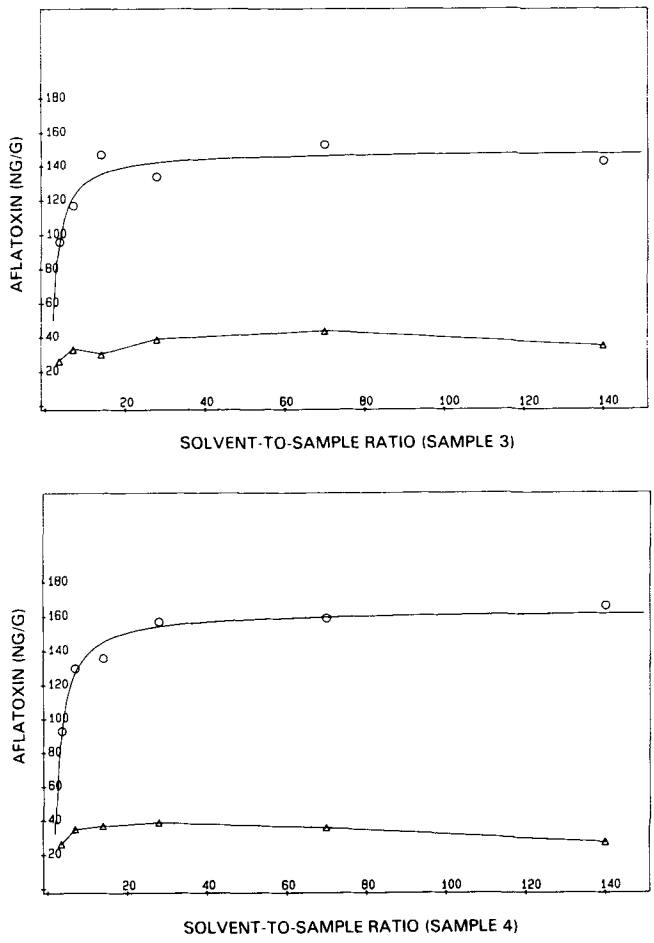

FIG. 2. Aflatoxin extraction with different solvent-to-sample ratios. ○ Aflatoxin B1, △ aflatoxin G1 (period 1987/1988).