

PHOSPHANE – CURRENT RESIDUE SITUATION

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Introduction

Phosphane (PH₃) is a cost-effective and rapidly acting fumigant that has gained a lot of popularity since the phasing out of MeBr. The mechanisms of action include metabolism disruption, oxidative stress and neurotoxicity, making PH₃ a highly efficient insect control agent.

Focus of this study

This study focused on elucidating the present residue situation of PH₃ and its metal-phosphide precursors in durable dry food products. In all, 114 conventional and 54 organic samples of dry commodities such as beans, cashew nuts and curcuma of different origin were sampled in 2025 and 2026 at local markets and analyzed for PH₃.

Analytical method

The analysis was conducted by a method previously published by the EURL-SRM in 2014 (see QR-code on the right), including minor adaptations. The method involves treatment with sulfuric acid, followed by headspace-GC-MSD.

To improve analysis of matrices with high fat content, the method was modified by adding a detergent at the beginning of the procedure. In addition, all samples were milled before weighing. In order to keep the pressure and potential gas leakage in the glass vessels low, the added volume of the PH₃ gas-mix was kept below 500 µL for each step of the standard addition approach. Therefore, sample weight was reduced or the sample preparation method altogether downsized in cases of high PH₃ levels in samples. Further adaptations made to the original method are negligible. The cutoff limit for semi-quantitative results was set at 0.6 µg/kg and the limit of quantification LOQ was set at 2 µg/kg.

Results

Among the 54 analyzed organic dry food samples, 24% showed detectable PH₃ levels, with 7.4% overall being equal to or higher than the LOQ (2 µg/kg). Among the 114 conventional dry food samples, 48% showed detectable PH₃ levels, with 31% exceeding the LOQ of 2 µg/kg and 14% being present at levels ≥ 10 µg/kg (mainly tree nuts, pulses & spices); see Table 1.

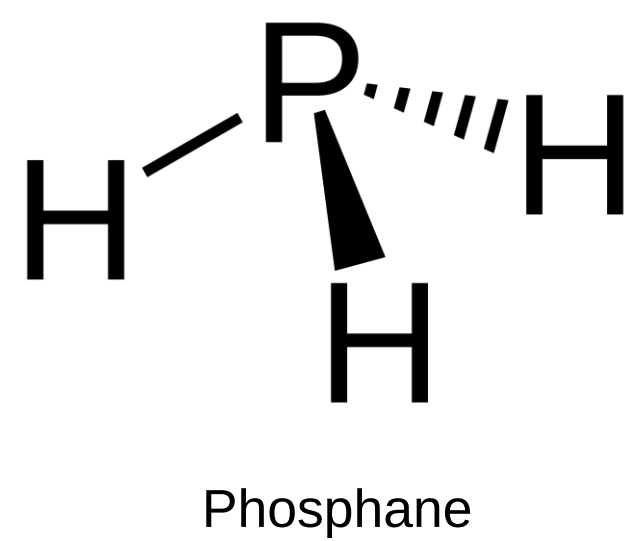


Table 1: Analyzed samples and positive findings of phosphane

Commodity of Samples	Overall Samples		Positive Samples		Findings ≥ 2 µg/kg		Findings ≥ 10 µg/kg	
	conv.*	organic	conv.*	organic	conv.*	organic	conv.*	organic
Cereals	13	13	3	2	1	1	-	-
Tree nuts	19	5	13	1	9	1	5	-
Pulses	24	5	14	2	11	-	5	-
Spices	28	8	15	3	9	2	4	-
Oily seeds	18	14	9	5	4	-	2	-
Green tea	4	8	-	-	-	-	-	-
Paprika (spice)	8	1	1	-	1	-	-	-
Sum (No.)	114	54	55	13	35	4	16	-
Sum (%)	100	100	48	24	31	7.4	14	-

*from conventional agriculture

In 9 of the 114 conventional samples (7.9%), PH₃ levels exceeded the respective MRLs. These were dry pulses (5x), cashew kernels (2x), sesame seeds (1x) and curcuma (1x); see Table 2.

Table 2: Samples with phosphane findings above the respective MRL

Commodity	Country of Origin	PH ₃ Level (mg/kg)	MRL (mg/kg)
Bean	Argentina	0.038	0.01
Bean	Egypt	0.017	0.01
Black sesame	Thailand	0.17	0.05
Cashew	unspecified	0.21	0.09
Cashew	unspecified	0.15	0.09
Chickpea	Romania	0.15	0.01
Chickpea	unspecified	0.029	0.01
Curcuma	unspecified	0.056	0.02
Lentil	Kazakhstan	0.066	0.01



EURL-SRM Method for Phosphane from February 2014

Summary and conclusions

A small-scale monitoring study was conducted on PH₃ in organic and conventional dry foods. PH₃ levels exceeded the LOQ ca. four times more in conventional products than in organic ones. MRL exceedances were only encountered in conventional products, in 7.9%. This raises the need to intensify controls, despite the additional effort involved.

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