and 98–99° E. Another specimen, incomplete and supposedly conspecific, was collected in the Kachin Hills, Upper Burma (Indian Botanic Garden Herbarium No. 50243) by Shaik Mokim[4]. Kingdon-Ward's No. 22839 suggests that *C. irrawadiensis* exists in pure form in the Shan States, and that uncontrolled crossing occurs between that species and *C. sinensis*.

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Fumigation under a Polyethylene Envelope

Protection of bagged grain in storage from loss through insect attack has been the subject of much practical work in recent years. A method now widely accepted is stack fumigation with methyl bromide under gas-proof sheets, combined with a treatment of the outside of the bags with an insecticidal dust or spray. In a warm climate such as Kenya's the insecticidal treatment does not 'seal' the stack from re-infestation, and a second fumigation is often needed after only three months. The new method under trial involves the sealing of stacks with a polyethylene cover which costs no more than paper, and the investigation of fumigating with methyl bromide under such a gas-permeable covering.

Polyethylene liners are employed to seal the bagging used for numerous products. The polyethylene generally employed is 2/1,000 in. thick and has been found to be sufficiently permeable to permit an initial sterilizing fumigation (Turtle, E. E., personal communication and ref. 1), yet to serve as a good seal against re-infestation. On a very small scale, stack sealing has been attempted at the Pest Infestation Laboratory, Slough[2]. A few bags were 'cocooned' with a sprayed polyvinyl plastic so as to initiate self-sterilization (due to oxygen depletion by the enclosed insects) and to create a seal against re-infestation.

A large-scale experiment has been carried out here, after consultation with officers of the Pest Infestation Laboratory, Slough, on stacks of 200-pound bags of maize 20 ft. by 20 ft. by 15 ft. high. One of these stacks was completely enclosed in 2·5/1,000-in. polyethylene, and was fumigated at the same time as an identical stack covered with gas-proof 'Neoprene' on nylon sheets. This control stack had the sheets removed after 48 hr. Gas samples were drawn from several sampling points, and the analyses for methyl bromide were done by Volhard's titration. Table 1 shows the typical results from one sampling point near the heart of each stack. Also in Table 1 are the concentration by time ($c \times t$) products estimated from the curves which are shown in Fig. 1. The initial difference in the levels of concentration has no relevance; in the first hours the distribution of gas was variable due to slight differences in the release of the gas, but both stacks received the same quantity of fumigant.

Table 1. Concentrations and the Times of Sampling for one Location, and the Resultant $c \times t$ Products

Location of samples	Concentration of methyl bromide in oz. per 1,000 ft.³ (or mgm./l.) at sampling times in hr. after gas release: ¼	1¾	5¾	10¾	23¾	47¾	51¾	71	$c \times t$ products: After 48 hr.	After 96 hr.
Control stack	1·4	6·4	9·8	8·7	10·7	5·8	3·4	0·5	415	440
Polyethylene stack	11·0	13·8	10·0	10·1	7·9	4·4	4·0	2·4	390	490

In the 48–96-hr. period, the gas distribution was found to be uniform throughout the stack. The continuation of the fumigation indefinitely is therefore of great advantage, for a considerable general increase in the $c \times t$ product will result. Considering the estimated 96 hr. $c \times t$ product, the polyethylene-covered stack gave superior results. The losses through the polyethylene are restricted to loss by diffusion: consequently, if the stack were increased in size the losses would be of even less significance. After 48 hr. most of the gas has been sorbed by the product, and the danger in entering the store after 72 or 96 hr. is negligible. When all the gas has been sorbed and broken down chemically, the bromine content in the product is still well below a toxic level.

In practice we believe that the use of the much stronger (5/1,000-in.), polyethylene and 'sand-snakes' to hold the envelope to the floor, together with a seal against re-infestation in the form of a heavy strip of insecticidal dust around the edge of the stack, will result in complete protection of the grain. Great economies should be possible since the cost of additional fumigations will be eliminated, insecticide costs will be negligible, and the capital cost of expensive fumigation sheets will not be incurred.

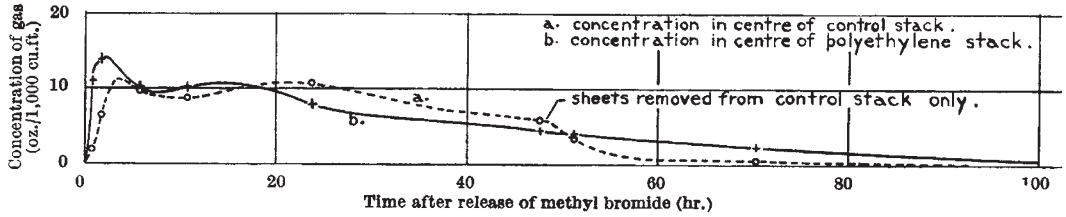

Fig. 1. Gas concentration curves for stacks: normally sheeted (*a*), and polyethylene covered (*b*)

The study is being continued, and a detailed report will be published elsewhere.

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