LETTERS TO THE EDITORS

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Use of Gamma Radiation for the Destruction of Wood-boring Insects

COMPLETE eradication of wood-boring insects in timber in buildings is difficult to achieve, particularly in structural members of large dimensions, often inaccessible for thorough surface treatment. Moreover, the value of insecticidal fluids and of fumigants is restricted by the impenetrability of many timbers and varies according to the species of insect and extent of attack. Radiation treatments may offer a means of reducing this problem of penetration, especially in large built-in timbers, such as oak infested by the death-watch beetle, but before their possible application in practice can usefully be considered, accurate data are required upon the effect of different dosages on the various stages of development of the insects.

With the object of obtaining this information, a series of experiments on a laboratory scale has been undertaken, and is still in progress, at the Forest Products Research Laboratory in co-operation with the Atomic Energy Research Establishment, Harwell, where the radiation treatments of experimental material are carried out. The investigations have so far been confined to insects free from wood or within samples approximately half an inch in thickness. The powder-post beetle, *Lyctus brunneus* Steph., which will complete its life-cycle in three to four months in oak sapwood at 25° C. and 75 per cent relative humidity, was used in the initial work; but this has now been extended to include the common furniture beetle, *Anobium punctatum* Deg., and the death-watch beetle, *Xestobium rufovillosum* Deg., both of which are more difficult to handle in the laboratory.

The following brief summary of the results to date indicates the possibilities and limitations of this type of treatment for the destruction of wood-boring insects: a progress report giving fuller details is being published elsewhere[1].

Using cobalt-60 as a source of gamma rays and measuring dosages in röntgens, it has been found that the eggs of *Anobium* and *Xestobium* can be killed by exposure to 4,000 r., if irradiated within one to four days of laying, but that their resistance increases rapidly as they develop. For example, dosages between 48,000 and 68,000 r. are necessary to kill mature eggs of *Anobium*, and in excess of 32,000 r. for *Xestobium*; but there are indications that eggs irradiated at much lower dosages give rise to larvæ which do not survive. High dosages are needed to kill larvæ of *Lyctus* quickly, but their development is arrested by treatment at 8,000 r. Incomplete results are available for *Anobium* larvæ, but it appears likely that their reaction is similar: the larvæ of *Xestobium* have not yet been studied.

Irradiation of *Lyctus* adults at dosages up to 48,000 r. did not inhibit egg-laying; but after treatment of both sexes of *Anobium*, *Lyctus* and *Xestobium* at 8,000 r. no fertile eggs were laid. Of the insects studied, only in *Xestobium* do the adults remain for several months within the timber before emerging, and this may be an important practical consideration in relation to the period during which infested timber containing adults as well as larvæ could most effectively be irradiated. Further work, with particular reference to this insect, is justified by the results so far obtained and is now in progress.

The investigation forms part of the programme of the Forest Products Research Board and is published by permission of the Department of Scientific and Industrial Research. We thank Dr. W. Wild, officer-in-charge of the Radiation Chemistry Group, Atomic Energy Research Establishment, Harwell, for the facilities provided by his Department and for his co-operation.

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[1] Bletchly, J. D., Xth Int. Congr. Ent., Canada, 1956 (in the press).

Lethal and Sterilizing Effects of Gamma Radiation on Insects infesting Cereal Commodities

INSECTS infesting stored foodstuffs have been treated with γ-radiation from cobalt-60 sources[1,2] and with accelerated electrons from a Van de Graaff generator[2-4]. Results have shown that cathode-, γ- and X-rays are comparable in their efficiency in destroying insects[2,5]. The design, operation and cost of constructing irradiation facilities for research purposes[6] and for the treatment of bulk foodstuffs on a commercial scale[7,8] have been detailed.

Research into the potentialities of radiation control of insect pests has been stimulated in the United Kingdom by the advent of high-flux γ-sources; these will be developed within the next few years from

Table 1

Calandra oryzae (L.)	*Laemophloeus minutus* (Oliv.)
Calandra granaria (L.)	*Laemophloeus ferrugineus* (Steph.)
Rhizopertha dominica (F.)	*Laemophloeus turcicus* Grouv.
Tribolium castaneum (Herbst.)	*Laemophloeus pusilloides* Steel and Howe
Tribolium confusum Duv.	*Laemophloeus ugandae* Steel and Howe
Oryzaephilus surinamensis (L.)	*Ephestia elutella* ((Huebn.)
Oryzaephilus mercator (Fauv.)	*Ephestia kühniella* Zell.
Trogoderma granarium Everts.	*Sitotroga cerealella* (Oliv.)
Callosobruchus chinensis (L.)	

Table 2. MEAN ADULT EMERGENCE OF IRRADIATED IMMATURE STAGES IN THREE TREATED CULTURES AND THE CONTROL

Dose (rep)	2×10^4		5×10^4	
Days after treatment	17		77	
Species	Irradiated	Control	Irradiated	Control
C. granaria	<1	884	0	1,552
C. oryzae	7	1,509	<1	5,004
R. dominica	19	566	0	1,250
T. castaneum	8	524	0	331
T. confusum	61	161	0	184
O. surinamensis	175	1,599	0	116
L. minutus	20	477	0	304
*L. ferrugineus**	10	6	0	6
S. cerealella	327	4,500	<1	963
E. kühniella	3	108	0	83
E. elutella	<1	27	<1	18
*T. granarium**	7	38	0	4

* Cultured on unfavourable food media to assist routine examinations.