COMPARATIVE LABORATORY TRIAL WITH INSECTICIDES UNDER TROPICAL CONDITIONS

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Introduction

Problems in protecting the harvest on the farm against damage by stored products pests are often a reason not to extend production above the amount needed for the own family. Immediately after the harvest the prices are low and do not cover the costs. Later, when prices become reasonable, the farmer suffers from losses in quality and volume due to damage by stored products insects.

On the rural level fumigants normaly cannot be used because

- it seems to be too dangerous to put fumigants in the hands of farmers who are not sufficently educated to understand the risks of these highly toxic chemicals.

- most traditionally built granaries are not adequately gas-tight.

To improve the on-farm storage system, especially in the Sahel region, a comparative laboratory test of different commercially available insecticides was made to compare their efficacy against some major pests of stored sorghum, the main staple food in this part of Africa. This study was undertaken on behalf of the German Agency for Technical Cooperation (GTZ). Chemical companies were invited to send their products and to give recommendations on the suitable dosage. It was pointed out that the efficacy should last at least for one storage season, i.e. 12 months, and if possible for up to 24 months.

Method

The tests were carried out with 18 commercial insecticides, 11 dusts and 7 EC-formulations. The sorghum was treated, thoroughly mixed and divided into several samples, one for immedial infestation, the others for storage at 36°C/5o% r.h., individual samples were infested after 1, 3, 6, 9, 12, 18 and 24 months, respectively.

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The efficacy was tested against

Cryptolestes ferrugineus Steph.	= rust-red grain beetle
Oryzaephilus surinamensis L.	= saw-toothed grain beetle
Rhyzopertha dominica F.	= lesser grain borer
Tribolium castaneum Hbst.	= red flour beetle
Trogoderma granarium Everts	= khapra beetle

The strains used had been reared in the laboratory for about 2o years and were expected to be non-resistent against insecticides. There were 5 replications for each insecticide and 1o replications on untreated sorghum to establish the control figures for mortality and offspring.

Each of these 5 resp. 1o test samples was infested with 3o adults. Larvae were used for infestation only in the case of Trogoderma granarium, due to the short life of the adult stage. The parental generation was allowed to stay on the sorghum for 21 days. After this time the mortality rate was determined and survivors were removed. The number of the offspring was counted weekly.

Results

The results will be published in detail in 1984. In tables 1 and 2 the informations on the efficacy are condensed by giving the months of effectiveness on the 1oo%-, 9o%- and 5o%-level in mortality rate of the adults and on the 1oo%- and 9o%-level of reduction of offspring in relation to untreated controls. Best results against all species tested were obtained with

	dose (g/kg)	active substance	(mg/kg)
Folithion dust	1	Fenitrothion	1o
Nuvanol N 2 P	1	Jodfenphos	2o
Satisfar DP 2	o.75	Etrimfos	15

In the case of Etrimfos, dose rates of o.25 g/kg of Satisfar DP 2 (5 mg/kg active substance) or o.o3 ml/kg of Satisfar EC (a.s. 15 mg/kg) also gave sufficent control of all species except R. dominica, where the preparations had only 12 resp. 9 months of efficiency.

Fig. 1: Storage time in months at 36°C/5o % r. h. of treated sorghum to obtain 1oo %, 9o % and 5o % mortality of infesting adults

producer	brand name	form of applic.	dosis applied	active substance	init. conc. mg/kg	Cryptolestes ferrugineus			Oryzaephilus surinamensis			Rhizopertha dominica			Tribolium castaneum			Trogoderma granarium		
						1oo%	9o%	5o%	1oo%	9o%	5o%	1oo%	9o%	5o%	1oo%	9o%	5o%	1oo%	9o%	5o%
Hoechst AG	Hostaquick 2 % dust	dust	2 g/kg	Heptenophos	4o	>24			>24			im.	4,5	6	1	1,5	2,5	1	5	6
CIBA-GEIGY GmbH	Damfin 2 P	dust	o,5 g/kg	Methacrifos	1o	1	5	11	3	6	15	<im.	im.	1	3	4	5	6	9	11
	Damfin 95o EC	EC	o,o1578 ml/kg		15	1	3,5	5,5	1	2,5	4	im.	o,5	1	1	2,5	4,5	1	1,5	5
Celamerck GmbH & Co. KG	Nexion Staub 2 %	dust	o,6 g/kg	Bromophos	12	12	23	>24	9	12	2o		<im.	o,5	3	5,5	8	9	15	2o,5
	Nexion 36 EC	EC	o,o33 ml/kg			6	9	1o,5	1	3,5	4,5			<im.		im.	o,5	3	irregular	
Dow Chemical GmbH	Reldan E 2	EC	o,o25 ml/kg	Chlorpyrifos-methyl	5,7	3	5,5	7,5	1	2	2,5	<im.	o,5	2	im.	2,5	6	6	11	22,5
Sandoz AG	Satisfar DP 2	dust	o,25 g/kg	Etrimfos	5	9	11	16	9	1o,5	13,5	im.	1	4,5	3	7	9,5	>24		
			o,75 g/kg		15	>24			>24			3	6	11	6	9,5	11,5	>24		
	Satisfar	EC	o,o1 ml/kg		5	3	6,5	13	1	2	3	im.	o,5	1	im.	o,5	2	12	2o	>24
			o,o3 ml/kg		15	6	1o	>24	6	7,5	9	im.	2	3,5	3	o,5	8,5	>24		
Bayer AG	Folithion 1 % DP	dust	1 g/kg	Fenitrothion	1o	>24			12	>24		18	>24		3	8,5	14	18	21	>24
	Folithion 5oo EC	EC	o,o24 ml/kg		12	6	7,5	14,5	1	3	6	3	6	9,5	im.	1	3	3	1o,5	2o
CIBA-GEIGY GmbH	Nuvanol N2P	dust	1 g/kg	Jodfenphos	2o	>24			12	2o	>24	<im.	2,5	5	3	8,5	13	12	21,5	>24
Deutsche ICI GmbH	Actellic 25	EC	o,oo8 ml/kg	Pirimiphos-methyl	(2)+	im.	2,5	5	im.	<1	1			<im.	<im.	<1	<1	1	6	irreg
Detia Freyberg GmbH	Detia Malathion Puder	dust	o,75 g/kg	Malathion	11,25	12	>24		18	>24		3	12,5	19	1	6	1o	12	15	19
Hoechst AG	Decis-Puder o,1	dust	o,25 g/kg	Deltamethrin	o,25	<im.	o,5	15	im.	irregular		>24				<im.	o,5	im.	irregular	
W.Neudorff GmbH	- - -	dust	2 g/kg	Permethrin	6		<im.	5	irreg.		22,5	>24					<im.	irregular		
Pflanzenschutz Urania GmbH	Dusturan Kornkäferpuder	dust	1 g/kg	Pyrethrum + Piperonylbut.	1,65+ 26,6		<im.	1			<im.		<im.	2,5			<im.		<im.	3
Frowein GmbH	Detmolin F	EC	o,28 ml/kg	DDVP + Pyrethrum + Piperonylbut.	9,8 + o,37+ o,18	im.	<1	<1	im.	<1	<1	im.	<1	<1	<im.	<1	irreg	im.	o,5	2
W.Neudorff GmbH	- - -	dust	1 g/kg	Bioresmethrin	3		<im.	1			<im.	1	5,5	7,5			<im.	irregular		

> 24 : efficacy at the 1oo%-, 9o%- or 5o%-level lasted throughout the entire experiment.

im. : adequate control was only obtained immediately after treatment

< im. : adequate control was not obtained, even immediately after treatment.

irreg. : efficacy did not regularly decline during storage.

\+ : in the case of Actellic instead of 4 mg/kg the initial concentration was only 2 mg/kg because we received Actellic 25 instead of Actellic 5o by mistake of the producer.

Fig. 2: Storage time in months at 30°C/50 % r. h. of treated sorghum to obtain 100 % and 90 % reduction in offspring compaired with untreated control

producer	brand name	form of applic.	dosis applied	active substance	init. conc. mg/kg	Cryptolestes ferrugineus		Oryzaephilus surinamensis		Rhyzopertha dominica		Tribolium castaneum		Trogoderma granarium	
						100 %	90 %	100 %	90 %	100 %	90 %	100 %	90 %	100 %	90 %
Hoechst AG	Hostaquick 2 % dust	dust	2 g/kg	Heptenophos	40	> 24*		> 24		3	9	9	18	3	3
CIBA-GEIGY GmbH	Damfin 2 P	dust	0,5 g/kg	Methacrifos	10	3	3	9	18	1	3	9	12	6	9
	Damfin 950 EC	EC	0,01578 ml/kg		15	1	6	3	3	3	3	6	6	1	1
Celamerck GmbH & Co. KG	Nexion Staub 2 %	dust	0,6 g/kg	Bromophos	12	> 24*		> 24*		< im.	im.	12	18	12	18
	Nexion 36 EC	EC	0,033 ml/kg			12	24	9	9	< im.	im.	6	9	> 24*	
Dow Chemical GmbH	Reldan E 2	EC	0,025 ml/kg	Chlorpyrifos-methyl	5,7	3	24	3	9	6	12	18	18	18	18
Sandoz AG	Satisfar DP 2	dust	0,25 g/kg	Etrimfos	5	12	> 24	> 24*		6	12	18	> 24	> 24	
			0,75 g/kg		15	> 24*		> 24*		12	> 24	> 24		> 24	
	Satisfar	EC	0,01 ml/kg		5	6	> 24	9	9	3	3	9	12	> 24	
			0,03 ml/kg		15	> 24*		18	> 24	6	6	18	> 24	> 24	
Bayer AG	Folithion 1 % DP	dust	1 g/kg	Fenitrothion	10	> 24*		> 24		18	18	> 24*		18	> 24
	Folithion 500 EC	EC	0,024 ml/kg		12	3	> 24	9	9	3	6	6	9	6	18
CIBA-GEIGY GmbH	Nuvanol N2P	dust	1 g/kg	Jodfenphos	20	> 24*		> 24*		1	18	> 24*		18	> 24
Deutsche ICI GmbH	Actellic 25	EC	0,008 ml/kg	Pirimiphos-methyl	(2)+	im.	6	1	3		< im.	6	12	6	18
Detia Freyberg GmbH	Detia Malathion Puder	dust	0,75 g/kg	Malathion	11,25	> 24*		> 24		18*	18	> 24*		12	12
Hoechst AG	Decis-Puder 0,1	dust	0,25 g/kg	Deltamethrin	0,25	irregular		9*	> 24	> 24		< im.	3	im.	3
W. Neudorff GmbH	- - -	dust	2 g/kg	Permethrin	6	< im.	3	1	> 24	> 24			< im.	1*	> 6
Pflanzenschutz Urania GmbH	Dusturan Kornkäferpuder	dust	1 g/kg	Pyrethrum + Piperonylbut.	1,65+ 26,6	< im.	1		< im.	< im.	im.		< im.		< im.
Frowein GmbH	Detmolin F	EC	0,28 ml/kg	DDVP + Pyrethrum + Piperonylbut.	9,8 + 0,37+ 0,18	im.	< 1	im.	1	im.	(3)	irregular		im.	1
W. Neudorff GmbH	- - -	dust	1 g/kg	Bioresmethrin	3	< im.	> 24	< im.	1	6	18		< im.		< im.

* : sometimes a very small number of progeny developed to adults.

> 24 : efficacy at the 100%- or 90%-level lasted throughout the entire experiment.

im. : adequate control was only obtained immediately after treatment

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irreg. : efficacy did not regularly decline during storage.

\+ : in the case of Actellic instead of 4 mg/kg the initial concentration was only 2 mg/kg because we received Actellic 25 instead of Actellic 50 by mistake of the producer.