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Field Studies with Baits Against *Solenopsis saevissima* v. *richteri*, the Imported Fire Ant[1]

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Abstract

A technique based on the incorporation of dyes in food is described for determining the acceptance of baits by the imported fire ant. Results of tests with this procedure show edible oils to be very attractive to these ants. In field tests with toxic baits, Kepone® (decachloroöctahydro-1,3,4-metheno-2*H*-cyclobuta-[cd]pentalen-2-one) has been the best toxicant tested to date. Control in some plots has ranged as high as 92%. Complete eradication has not been obtained even with two treatments.

Poison baits have been used against various species of ants for many years. A classic example is the use of a sweet bait containing either sodium arsenite or thallium sulphate for the control of the Argentine ant, *Iridomyrmex humilis* Mayr. Very little work has been done to investigate the possibility of baits as a control for fire ants. Travis (1939) reported the use of thallium sulphate and thallium acetate in syrup baits against the fire ant, *Solenopsis geminata* (F.). The thallium sulphate was toxic in cage tests but not in the field, and the thallium acetate was effective in both cage and field tests; however, results in later tests were erratic, probably due to weather conditions. H. B. Green (1952) tested a bait consisting of thallium sulphate with corn meal and oil against the imported fire ant, *Solenopsis saevissima* v. *richteri* Forel, and reported the material was very effective on captive colonies but it was ignored when it was scattered in the field around the mounds. A considerable amount of unpublished work on this subject has been done by other workers, namely: Sidney B. Hayes, Department of Zoology-Entomology, Auburn University; H. B. Green, Mississippi State University and Agricultural Experiment Station; and C. C. Bowling, Texas Agricultural Experiment Station.

The purpose of this paper is to (1) describe a technique for evaluating the acceptance of baits by imported fire ant colonies and individual workers, and (2) present results of preliminary tests with toxic baits against natural infestations of the imported fire ant.

Methods and Results.—Early in our work it became evident that it would be necessary to have some standardized method for evaluating the acceptance of nontoxic and toxic baits by individual imported fire ant colonies. The following techniques have been developed.

Nontoxic-Bait Acceptance Test.—This test is easy to

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Table 2.—Results of tests with some toxic baits against imported fire ants.

Bait	Toxicant	Concentration (%)	Pretreatment Count of Active Mounds	Per Cent Reduction in Active Mounds After Weeks Shown			
				1	2	4	8
		1958 tests (2 replications)					
Dog food[a]	Dieldrin	0.01	70	13	54	49	48
	Dieldrin	.1	39	33	67	31	56
	Chlordane	.01	53	0	36	38	34
	Chlordane	.1	49	35	55	38	31
	Heptachlor	.05	31	48	52	45	45
Dog food—pork fat (9:1)	Heptachlor	.05	31	41	52	26	32
Dog food—Staley sauce bait (9:1)[b]	Heptachlor	.05	42	40	79	67	50
Dog food—dried blood (19:1)	Heptachlor	.05	51	10	55	41	31
Dog food (check)	—	—	18	0	0	0	0
	—	—	37	0	22	13	11
		1959 tests (1 replication)					
Peanut oil	Heptachlor	0.5	49	24	37	59	65
		.25	31	16	61	58	71
		.1	34	32	50	71	65
		.05	66	8	38	80	36
		.025	71	8	54	62	52
		.01	32	13	56	81	50
		.001	24	0	13	17	0
Neats-foot oil	Heptachlor	0.05	16	0	0	38	6
A. E. Staley Co. bait, SPIB FA-19C	Heptachlor	.05	32	16	41	50	34
Check	—	—	46	0	9	35	37

[a] Finely ground Purina dog chow, produced by Ralston Purina Co., St. Louis, Missouri.
[b] Enzymatic protein hydrolysate, produced by A. E. Staley Manufacturing Co., Decatur, Illinois.

Table 3. Results of tests with Kepone baits againts imported fire ants.[a]

Bait	Toxicant Concentration (%)	Pretreatment Count	Per Cent Reduction in Active Mounds After Weeks Shown					
			1	2	4	8	12	18
Peanut oil	1.0	23	48	72	74	62	66	17
	.5	35	13	44	63	58	79	50
	.1	26	2	31	50	36	61	44
Peanut oil and vermiculite	1.0	38	58	71	78	85	82	37
	.5	28	13	15	42	68	86	0
	.1	25	31	31	37	76	77	0
Corn oil and vermiculite	.5	21	40	36	62	88	78	0
Corn oil and vermiculite plus 0.01% propionic acid	.5	24	55	43	70	87	92	0
Check	—	20	3	10	3	26	39	28

[a] Average of 2 replications.

as a toxicant in baits consisting of peanut oil alone; or peanut oil, corn oil, or corn oil plus propionic acid (0.01%) impregnated on vermiculite granules. Propionic acid was used because laboratory tests had indicated that it might increase the attractiveness of vegetable oils. The plot design and method of treatment was the same as in the previous test except that the granular baits were applied by hand. Twenty-three pounds of the granular baits were applied per plot

The results of the tests with Kepone are presented in table 3. After 12 weeks there was apparently a fairly good reduction in colonies on all plots. The corn oil-propionic acid bait impregnated on vermiculite with 0.5% Kepone gave the best results (92%). However, after 18 weeks there was a great reduction in the control obtained on all plots. The majority of these mounds were very small. This fact probably indicates reinfestations from a mating flight. A heavy mating flight occurred at the time

Table 4.—Tests to determine the effectiveness of 2 successive toxic bait treatments against imported fire ants.[a]

Formulation		Pretreatment Count[b]	Per Cent Reduction in Active Mounds After Weeks Shown				
Initial Treatment	Retreatment		1	2	4	8	16
Peanut oil	Peanut oil	31	46	62	75	70	77
	Corn oil	37	59	69	53	65	51
	Peanut oil[c]	47	33	67	56	35	15
	None	31	43	74	56	47	41
Corn oil and propionic acid	Corn oil and propionic acid	19	53	79	61	68	63
	None	26	37	40	27	33	21
Peanut meal and peanut oil (5:3)	Peanut meal, linseed oil meal and peanut oil (5:5:6)	22	95	98	74	91	95
Check	—	23	0	0	0	0	0

[a] Initial treatment Aug. 28, 1959; retreatment Oct. 2, 1959. Unless otherwise indicated, the toxicant was 0.25% by weight of Kepone.
[b] Average of 2 tests.
[c] Toxicant was 0.5% Dipterex by weight.

the plots were treated. The 18-week period between plot treatment and examination is a sufficient period of time for the establishment of incipient ant colonies. The field had been disked earlier in the year and was not leveled off smoothly. This condition, when accompanied by wet, warm weather, has been found to be very favorable for survival of queens and development of the colony. In most instances, the worker ants present were very small, with only a few major workers present. It is also possible that the increase was due partly to a division of the large colonies after treatment. Imported fire ant colonies almost invariably move after they have consumed a poison bait. During the hot summer months, imported fire ants do not always build a visible mound. This is particularly true of young colonies. With the onset of cool weather, they build and increase the size of the mounds.

It is believed, however, that the main source of increase in colonies was due to reinfestation, and the results obtained through 12 weeks are a true picture of the effectiveness of the baits. The reinfestation only reemphasizes the fact that any bait treatment will require at least two or more applications to obtain complete control.

A third series of tests was conducted to determine the effectiveness of two successive bait treatments at intervals of 5 weeks. Since previous observations had indicated that the ants might develop "bait shyness," some of the plots were retreated with the same bait while in others the bait or toxicant was altered. The plot arrangement and treatment procedure were the same as in the previous tests except that the treatment bands were spaced at 20-foot intervals, and 1 gallon of liquid bait and 46 pounds of granular bait were applied per plot. The baits used in each test were as follows (unless otherwise indicated, the toxicant was Kepone at a concentration of 0.25%): (1) peanut oil, two treatments; (2) peanut oil followed by corn oil; (3) peanut oil followed by peanut oil containing 0.5% Dipterex® (dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate); (4) peanut oil, one treatment; (5) corn oil containing 0.01% propionic acid, two treatments; (6) corn oil containing 0.01% propionic acid, one treatment; (7) peanut meal and peanut oil (5:3 ratio) followed by peanut meal, linseed meal and peanut oil (5:5:6 ratio).

The data from tests where two applications were made are given in table 4. The results show that the only bait which gave satisfactory control after 16 weeks was one consisting of peanut meal and peanut oil (95%). One application of this bait gave a high initial reduction (98% after 2 weeks) which decreased to 74% after 4 weeks.

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