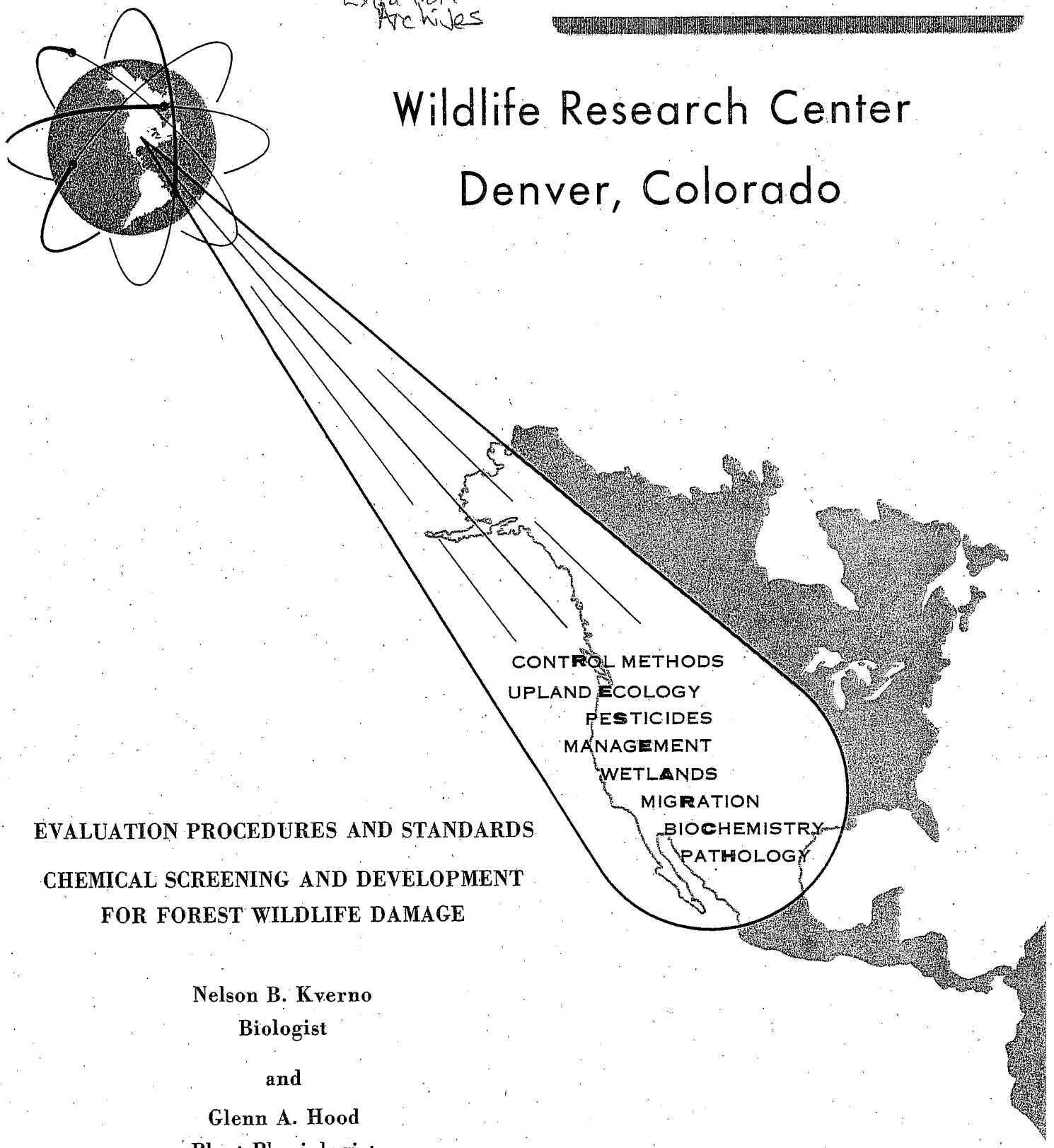
Wildlife Research Center
Denver, Colorado



EVALUATION PROCEDURES AND STANDARDS

CHEMICAL SCREENING AND DEVELOPMENT FOR FOREST WILDLIFE DAMAGE

Nelson B. Kverno
Biologist

and

Glenn A. Hood
Plant Physiologist

UNITED STATES DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife
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TABLE OF CONTENTS

Page

EVALUATION PROCEDURES

Problem

Forest and range rehabilitation is necessary to our nation's resources in meeting the requirements of a growing population. Animal damage is one of the major factors limiting reforestation and range revegetation. The monetary value of this damage is appreciable. As an example, animal damage to forest crops in the Douglas-fir region of the Pacific Northwest alone is estimated at 12 to 15 million dollars annually.

Both game and non-game mammals are involved and inflict various types of damage. Small rodent and shrews have at times completely defeated reseeding programs through consumption of seeds. Mice, rabbits, hares, mountain beavers, and deer may browse the seedlings, both planted and wildlings, that become established. Mice also girdle young seedlings; and squirrels, porcupines, and even bear attack saplings and mature trees.

Animal damage is a complex problem. The solution will require many management techniques, an important one being chemical protectants. Numerous chemical formulas, each designed for a specific purpose, will be needed.

The Bureau of Sport Fisheries and Wildlife has a vital interest in the development of chemical protectants for use in wildlife management. Since the market for these chemicals is limited, extensive development of compounds by the chemical industry for this purpose may not be justified. A cooperative program is the best approach. Success in such a program will require the combined efforts of the chemical industry, wildlife research, and forest land management groups.

Selection of Compounds

Compounds that are received at the Denver Wildlife Research Center may either be solicited or provided by chemical companies under terms of an agreement. Selection of solicited compounds is by Center personnel and is based on available information often derived through discussions with chemical company representatives. Ordinarily these compounds have been developed for another use and are either on the market or in the late stages of development. The compounds submitted under terms of an agreement are selected by the supplier and generally are coded. These chemicals are chosen during early evaluation and are not necessarily being developed for a specific purpose. The selections are usually based on screening tests, results with related compounds, or because they represent new and interesting chemical groups.

An exact check list for selecting a candidate compound is difficult to establish; every guiding rule would have an exception. Three properties of a chemical, however, should be considered. The first and most important is whether there is evidence or suspicion of biological activity on mammals.

The other two considerations are that the compounds be reasonably stable and non-phytotoxic. There are all degrees of activity which may be greatly influenced by formulation, thereby leaving some latitude for discretion. Chemicals of two major types are desired: mammal repellents and toxicants. Repellents, to have broad usage, must possess relatively low mammalian toxicity to insure a margin of safety between accepted levels and those levels producing adverse effects. In contrast, the toxicants, to be effective, should be well accepted and possess high mammalian toxicity. Compounds of both types which are believed to be absorbed and translocated by plants are of special interest.

Many factors must be considered in the ultimate acceptance or rejection of a compound. Cost of production, ease of formulation, hazard to the handlers, side effects to animals other than the target species and, of course, the effectiveness in regard to intended use must all be weighed.

Submitting Compounds

All available information on a compound should accompany it at the time it is submitted to the Denver Wildlife Research Center for evaluation. Submission forms are available in case there are no data sheets. A minimum of 4 grams of technical grade chemical is needed for the initial evaluations. If the chemical is selected for testing at the Olympia, Washington field station, an additional 150-gram sample is required.

A portion of the sample will not be used if the compound is rejected during early testing phases. It is suggested that instructions be given regarding disposal of unused portions; these will be returned to the company upon request or destroyed.

Reporting

The initial bioassay and phytotoxicity tests are usually completed and the results reported to the chemical company within 60 days of receipt of the compound. Occasionally, however, factors such as unavailability of animals interrupt the evaluation schedule.

Studies conducted at the Olympia field station are by necessity seasonal. To standardize the conditions of the foliage and to permit transplanting, the tests are restricted to the "dormant" period, mid-October through mid-March. Reporting of compounds sent to the field station will, therefore, depend upon the time the compound is received. Compounds received prior to October and perhaps as late as the first of January would be scheduled for evaluation during that testing season. Results of nursery phytotoxicity tests would not be available until mid-summer.

Testing Procedures

Compounds received at Denver are assigned a Denver Research Center (DRC) number which is used to identify the compound during the entire evaluation process. The initial test determines if the compound is biologically

active on mammals. The next test, restricted to the active compounds, defines the type and degree of activity through determining the approximate lethal dose (ALD). Following seed and foliar phytotoxicity tests, the better compounds are discussed with the supplier. Some materials are rejected at this point because of other factors such as production costs. A sample of each of the surviving chemicals is then sent to the Olympia field station in Washington for an evaluation of its effects on several target species of mammals held in outdoor pens. Field testing under varied forest conditions is then conducted to complete the evaluation program. A more detailed description of the individual tests is as follows:

Initial Bioassay

The candidate chemical is applied to sized white wheat at an arbitrary level of 2 percent by weight. Chemicals are applied onto wheat kernels by the simplest practical method, minimizing chemical interaction of additives. Live-trapped native deer mice (Peromyscus maniculatus) are the test animals. Five individually caged mice are offered 25 treated wheat seeds each day for 3 consecutive days. The animals are then observed 4 days for chronic effects, completing the initial bioassay test. Standard laboratory rat pellets are available in the cages as a sustaining ration.

Because contamination by urine or feces precludes accurate weight determination, the treated seeds are counted into and out of dishes which are placed in the cages every 24 hours. The number of treated seed consumed by individual animals is recorded on the bioassay forms, and at the end of the test period the percent food reduction is computed. Animal mortality is designated by a red bar placed after the number of seed consumed for that day. The letter "K" indicates that the animal "kibbled" or avoided the chemical by carefully "chipping" off the treated bran coat. The amount of "kibbling" is not a measurable factor but is considered when decisions are made regarding acceptance or rejection of the chemical for additional testing. A number following an oblique line refers to seed dropped from the cage onto the paper below. This factor is not weighed in calculations unless the number of dropped seeds is so high that it restricts consumption by the test animals.

If a compound exhibits a sufficient degree of activity, i.e., avoidance or mortality, it is subjected to the second test, which defines the type of activity. Mortality of 60 percent of the test animals and/or 50 percent reduction in food intake is the minimum degree of activity acceptable for further testing.

Approximate Lethal Dose (ALD) Determination

If a high degree of mortality occurs on the initial bioassay test, toxicity is obvious; however, if seed is avoided, the property of the compound is not apparent. Frequently toxic compounds are avoided at the concentration offered. Therefore, when a chemical is avoided, the next step is to ascertain why. Logically, an ALD is determined since this

information should disclose the true nature of the avoidance. With highly toxic compounds that are not well accepted at the initial concentration, another concentration is tried based on the calculated toxicity of the compound. Knowledge of toxicity will also indicate when a compound is exhibiting repellency rather than sublethal effects.

The test is a slight modification of the method described by William Deichman and T. LeBlanc (1943).[1] Using about six animals, this method makes possible a determination within broad limits of the approximate lethal dose. This test employs graduated concentrations, each one 50 percent higher than the preceding one, starting at 0.001. The approximate lethal dose is the lowest concentration that kills the animal. The starting point is arbitrarily selected by the investigator based upon available information.

The formulation used for the ALD determination is usually a suspension of the chemical in corn oil, water, or a 1 percent solution of Carbopol. The chemical is administered by oral injection, and the animals are observed for a period of 2 or 3 days.

Seed Phytotoxicity

Protection of seed from depredation by animals requires that the chemical agent employed be tolerated by the seed, thereby allowing the seed to germinate and develop normally. The third step in the evaluation series is to determine what effect the candidate chemical has on seed germination.

If the compound exhibits sufficient biological activity, a portion of the seed (wheat and Douglas-fir) treated for the bioassay is reserved and the test initiated. One hundred treated seeds are planted in vermiculite and placed into a seed germinator. Seedling counts are made at periodic intervals and compared with an untreated control.

Foliar Phytotoxicity and Acceptance Tests (Repellents)

Potted plants of two species are employed in the phytotoxicity tests; 1-year-old Douglas-fir seedlings with new foliage and 1-week-old bean seedlings are used. Suspensions of the candidate chemicals are sprayed on two containers of each species (pots contain a minimum of two Douglas-fir or three beans) until the leaves are wetted to capacity. Following application the seedlings are held in the greenhouse for 2 weeks although phytotoxicity, when occurring, is usually apparent within 1 week.

The compounds are formulated as a 5 percent concentration in a 1 percent Carbopol or an acetone-water-emulsifier carrier. If the compound is phytotoxic at 5 percent, a second test is conducted at a 1 percent concentration.

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[1] Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Within a day of spraying one of the two treated and one untreated control pot of each plant species are offered to individually-caged domestic rabbits. At the end of the 24-hour test period visual estimates are made of the amount of treated and untreated plant material consumed.

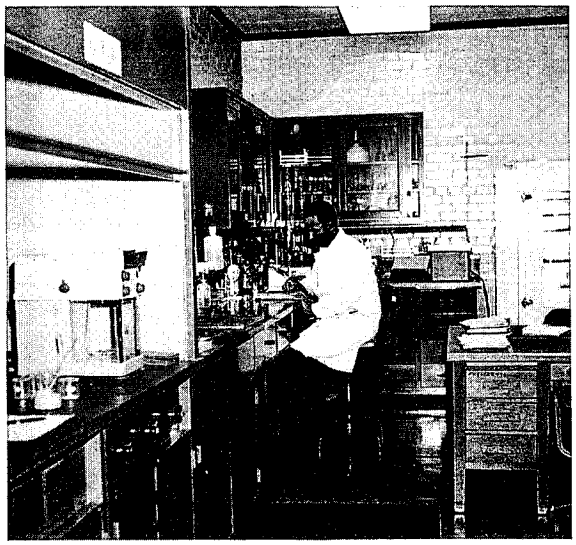
Phytotoxicity generally precludes further study of a compound as a foliar repellent. There will, however, be an occasional exception with compounds exhibiting a high degree of repellency. Attempts will be made to mask the phytotoxic effect of some of these highly active materials.

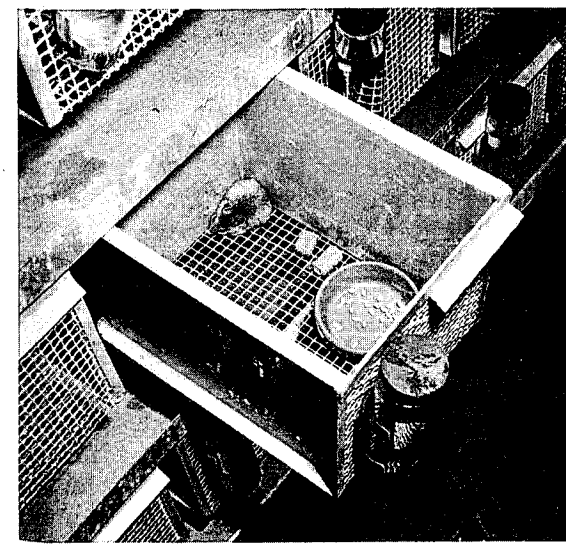
Concentration Test (Toxicants)

To evaluate acceptance of toxic compounds, the order of toxicity of the compounds must be considered. When two chemicals have the same toxicity and one is accepted, for example, five times better than the other, it is the preferred lethal agent, other factors being equal. Concentrations of chemical are prepared on wheat seed to produce a 4- to 6-seed lethal bait. This establishes a common denominator for comparing the degree of acceptance. Compounds that are not as well accepted as commercial rodenticides are rejected.

Douglas-fir Bioassay

One of the important problems of reforestation is protecting seed from wildlife. Forest managers need both toxicants for reductional control and chemical repellents that can be applied directly to the seed. A major obstacle is presented by the physical structure of tree seed; the edible portion is surrounded by an inedible hull. Rodents, by manipulating the seed, are able to cut through a chemically coated hull with a minimum contact with the chemical. Highly active repellents or toxicants which are not phytotoxic are potential candidates. These materials are coated on Douglas-fir seed at a 1 percent concentration. Fifty seeds are offered daily to five individually-caged Peromyscus for three consecutive days. Failure to protect Douglas-fir seed is not, taken alone, cause to reject the chemical.





Mammal evaluations at the Denver Center. Left: Laboratory facilities for preparing seeds for bioassay studies. Right: Bioassay cage ready for test; it contains a Peromyscus m., sustaining ration, and a dish with 25 treated wheat seeds.

Plant evaluations at the Denver Center. Left: Seed phytotoxicity tests conducted in a controlled environment germinator. Right: Greenhouse studies of phytotoxicity tests utilizing foliar applications of candidate chemicals on bean and Douglas-fir seedlings.

Translocation Tests (Laboratory and Field Station)

Compounds that can be translocated into the seed or seedlings are of special interest. Only those chemicals known to be absorbed by plants or those in the advanced stages of development as repellents or toxicants are tested for translocation. In the laboratory tests the chemical is added to the growing media at concentrations determined by its properties. The plant material then is analyzed chemically or through bioassay. In the field station studies 25 nursery-planted Douglas-fir seedlings are treated by root spraying or by dusting the planting hole.

Field Station Pen Tests

The pen tests are one-animal tests of short duration. They are used to evaluate toxic compounds and to rapidly indicate the degree of repellency of candidate chemicals. In these tests the toxic compounds are offered on bait carriers or, if systemic, as treated seedlings. When testing repellents, the seedlings are treated by immersing the plants into a mixture of the chemical and an adhesive. The seedlings with the roots removed then are offered to the animals by stapling them to "exposure boards." Due to their erratic behavior, the pen tests with deer have not proven practical as a quick indicator for this species.

Field Station Enclosure Studies

The enclosure tests evaluate treatments under semi-field conditions. The analytical design permits up to 16 evaluations at one time. The design is the same for both deer and snowshoe hares, the only difference being in the size of the units; the hare enclosure is 2 acres in size whereas the deer enclosure is $2\frac{1}{2}$ acres. Two-year-old (2-0) Douglas-fir seedlings are the standard carrier for the candidate repellent chemicals. To insure uniform coverage the seedlings are treated by immersion into a mixture of the chemical and adhesive. Two concentrations, 3 and 6 percent, of the candidate repellents are employed. The treated seedlings then are transplanted into the enclosure and exposed to the animals until a predetermined number (approximately 80 percent) of the untreated control seedlings are cut; this serves as an indicator of feeding pressure. The experimental treatments are compared to a 6 percent TMTD and to untreated control seedlings in the snowshoe hare enclosures, and to a 6 percent TMTD, a 6 percent ZAC and untreated controls in the deer studies. To overcome individual behaviorisms a minimum of 10 animals is used for each test.

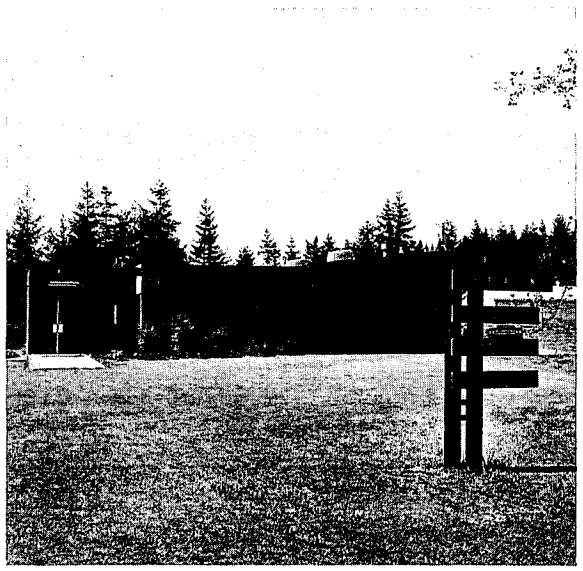
The test design consists of 10 randomly located plots (27' x 45'), each providing 160 tree locations spaced at 3-foot intervals. The tree locations are assigned at random within each plot for each of the 16 possible treatments. Therefore, each treatment is represented by 16 trees in each of the 10 plots. Frequency of cutting is recorded as negative (-) or affirmative (+), and the data are analyzed by arc-sin transformation and analysis of variance (F-test). If the F-test indicates significances among treatments, the data are then carried through Duncan's Multiple Range Test for a comparison among treatment means. Thus the multiple range test is used to indicate which treatments are as good or better than the standard.

Field Station Phytotoxicity Studies

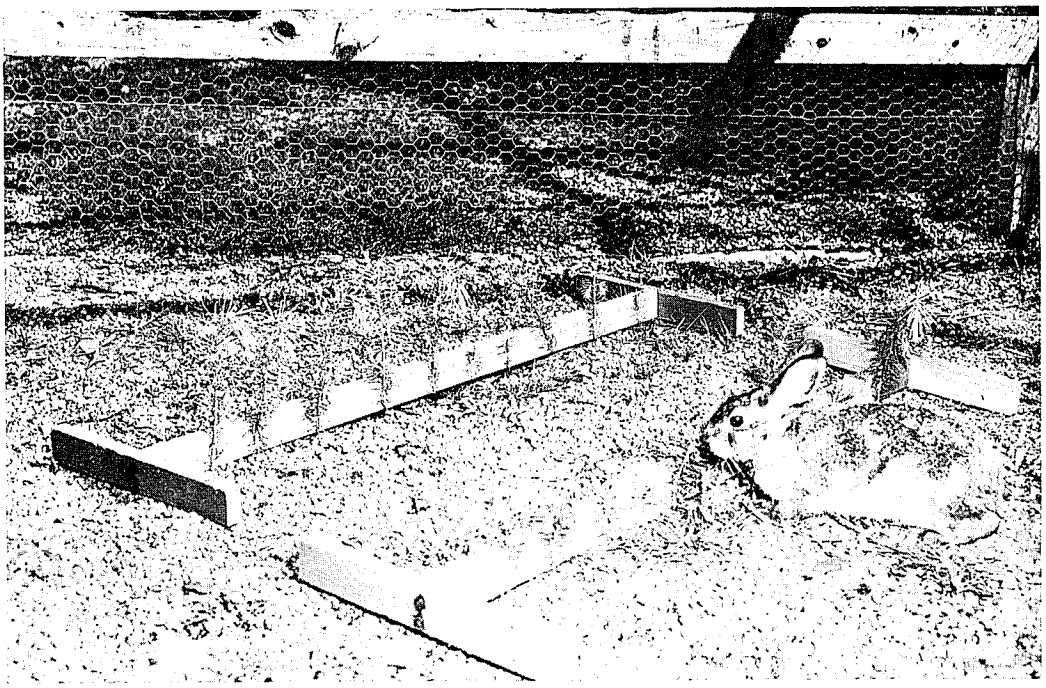
An additional 25 seedlings are treated at each concentration at the time the seedlings are prepared for the enclosure studies. These seedlings are then transplanted into a nursery and held through one growing season, or until phytotoxicity is evident.

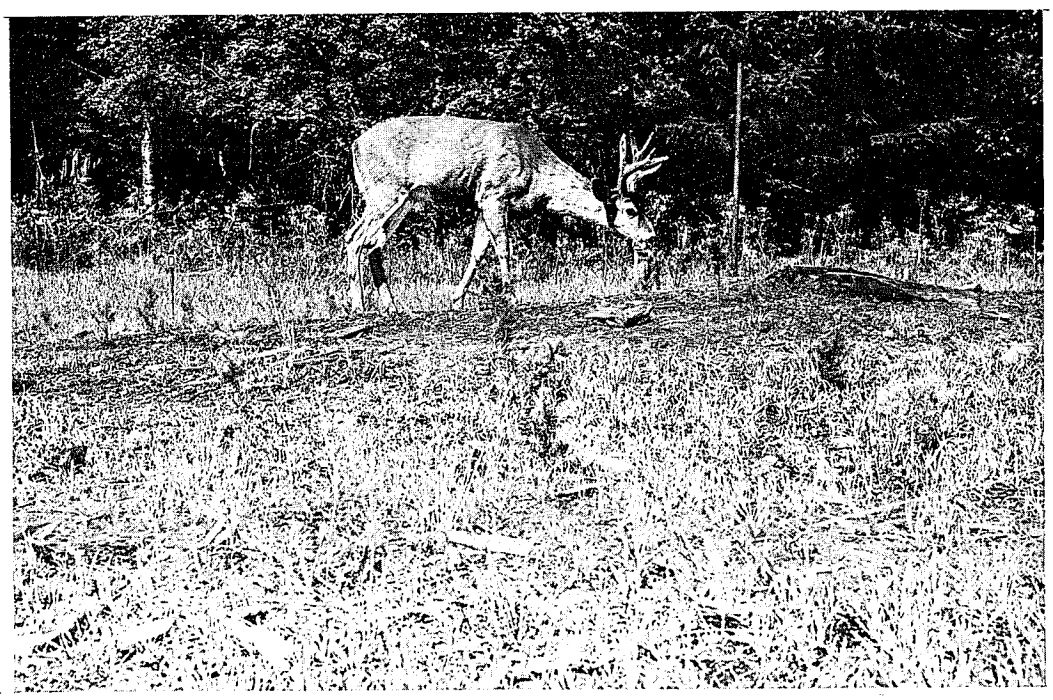
Field Evaluation

A series of plot designs is being evaluated cooperatively in the Pacific Northwest. From this study a standard procedure for evaluating repellent compounds will be adapted. The evaluation of toxic compounds will vary greatly with their intended use. All field testing will be done cooperatively with land managing agencies.



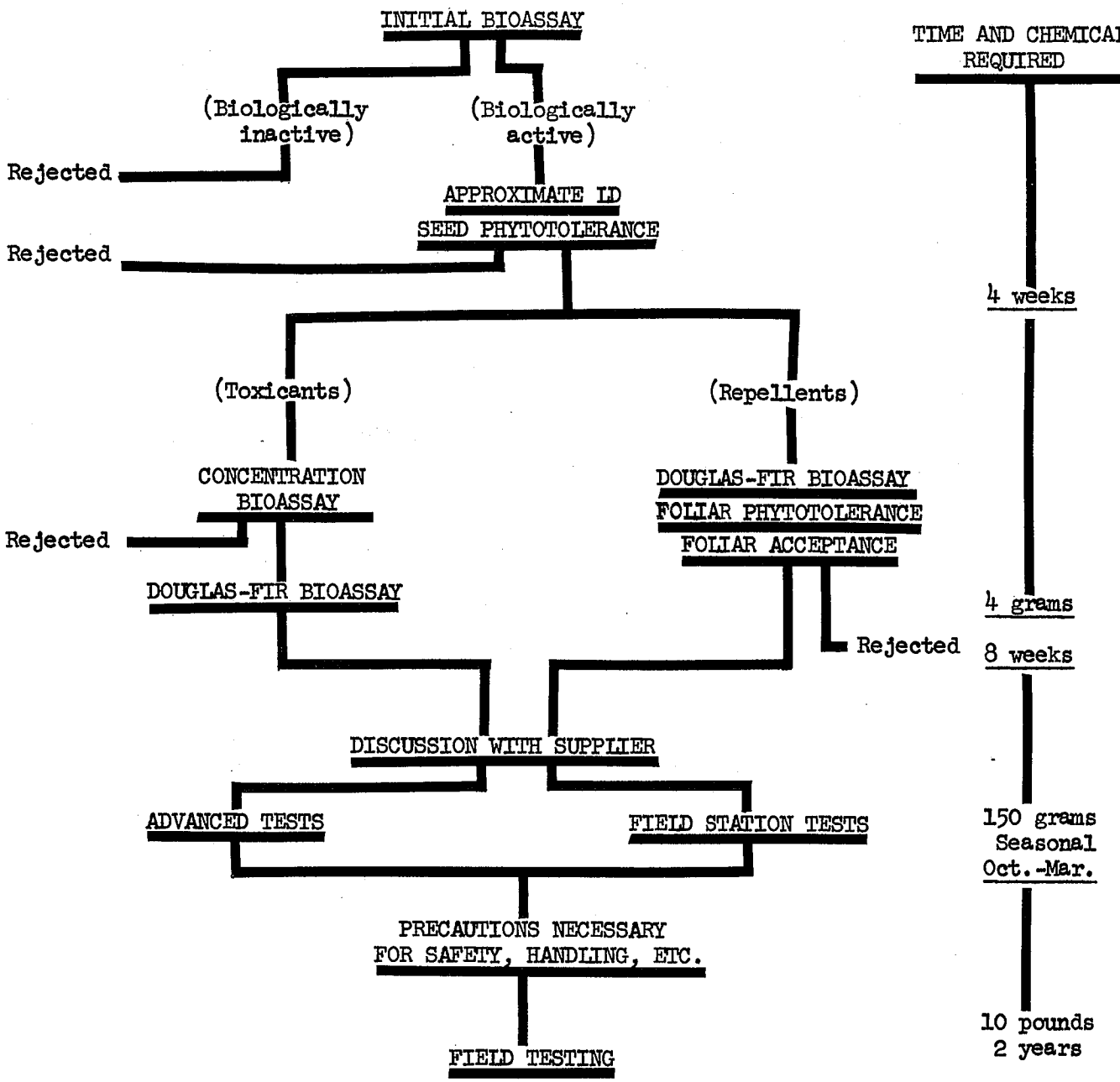
Advanced evaluations at field station. Left: Forest Research Center, Olympia, Washington (space provided by U. S. Forest Service). Right: Applying systemic compound to seedlings (nursery provided by Washington Department of Natural Resources).





Mammal evaluations at field station. Upper: Pen test in which seedlings tacked to exposure boards are offered to snowshoe hare. Lower: Enclosure study with seedlings planted at random within a grid.

STAGES IN EVALUATION AND DEVELOPMENT OF CHEMICALS FOR PREVENTION OF FOREST ANIMAL DAMAGE



STANDARDS

Compounds

Compounds, both commercial and experimental, recognized for their mammalian repellency or rodenticidal properties are being used as standards. These compounds previously were tested on two mammal species, laboratory white mice and native Peromyscus m.; the resulting data permit the investigator and the supplier to comparatively measure the relative effectiveness of candidate compounds. The following compounds were used as standards:

Repellents

TMTD--tetramethylthiuram disulfide
ZAC--zinc dimethyldithiocarbamate cyclohexylamine complex
Beta-Nitrostyrene
TNB-A--trinitrobenzene-aniline

These four compounds are effective repellents for hares, rabbits, deer, and some other wild mammals. TMTD and ZAC are applied as foliar repellents by spraying seedlings with 5 to 10 percent concentrations. Beta-nitrostyrene, while highly repellent, is very phytotoxic as foliar or seed treatments. Varying degrees of phytotoxicity have been observed when TNB-A was applied as foliar treatments.

Lethal Agents

Endrin
Compound 1080--monosodium fluoroacetate
Strychnine
Tetramine--tetramethylene disulfotetramine
DRC-714

The first three compounds are currently available and are being used as rodenticides with varying degrees of success and associated hazards. The other two compounds are experimental toxicants.

In the field of forest animal damage control Endrin is primarily used as a seed treatment, whereas compound 1080 and strychnine are usually employed on baits. Secondary hazard properties of compound 1080 restrict its use as a rodenticide. Strychnine is poorly accepted by some animals, and others build up tolerances to the compound, thereby reducing its effectiveness. Tetramine is being tested both as a seed treatment and systemic toxicant. Compound DRC-714 is an unidentified, experimental rodenticide that is well accepted by some problem animal species.

Rating System

Toxicity and repellency are vague, qualitative terms. Frequently, highly toxic compounds are referred to as repellents. Toxic chemicals that are avoided, or consumed at sublethal levels, may produce a response similar

to that of "repellent" chemicals. Such poorly accepted toxic compounds, however, often are responsible for adverse side effects. Rather than attempt to define the two terms and categorize all active chemicals accordingly, a rating system has been developed and adapted that takes into consideration three important functions: (1) the lethal level of the compound; (2) acceptance in relation to the lethal dose; and (3) effect on or mortality of the test species. Each of these dimensions can be measured and assigned a value, thus permitting comparisons.

The ALD is the basis of the rating system. Consumption calculated on first day's acceptance is expressed in amounts of an ALD consumed. The effect is expressed in percent mortality of the test animals. To be considered a good candidate repellent, it is necessary that the compound have a low order of toxicity, be poorly accepted, and possess an adequate margin of safety. A compound with a rating of 1000-0.05-0 thus would be relatively non-toxic (1000 mg/kg), poorly accepted (0.05 of a lethal dose), and have no lethal effect on the test animals (0 percent mortality). Such a compound would be considered a promising repellent. A rating of 5-10-100 would indicate a highly toxic compound (5 mg/kg) that is well accepted (10 times a lethal dose) and extremely effective (100 percent mortality).

To comparatively evaluate the lethal agents it is necessary that a second bioassay be conducted at a concentration adjusted to the toxicity of the compound. For a true picture of acceptance it is reasoned that more than one seed should be required to produce a lethal dose. The number of seeds lethal for the acceptance test has been arbitrarily established at five, with a permitted range of not less than four or more than six seeds lethal.

It is not uncommon to have the test animals survive bioassays where they consume in excess of the calculated lethal dose. These discrepancies can generally be explained in one of two ways: (1) the compound is unstable or (2) it is degraded or excreted by the test animals at a rapid rate.

Concentration Tables

Concentration tables are included for the two animal species (laboratory white mice and native Peromyscus m.) employed in the tests of compounds used as standards. Weighted averages are used in the tables to aid in evaluations of bioassay test results. Values are expressed as the approximate number of treated wheat seeds required to produce a lethal reaction in relation to the ALD and concentration of the chemical employed. These tables may be used in two ways: (1) to determine the number of seeds that would be lethal at a given concentration when the ALD is known or (2) to estimate the ALD within broad limits from data obtained from the bioassay record.

Where required, slight modifications are made in the concentrations to produce the 4 to 6 seed lethal treatments described previously.

TABLE 1. APPROXIMATE NUMBER OF WHEAT SEED LETHAL TO 20 GRAM PEROMYSCUS AT GIVEN CONCENTRATIONS

	APPROXIMATE LD (mg/kg)																		
Conc.	1600	1070	710	470	320	210	140	94	62	42	28	18	12	8	5.5	3.7	2.4	1.6	1
2.00%	33	22	15	9.6	6.6	4.3	2.9	1.9	1.3	0.86	0.57	0.37	0.25	0.16	0.11	0.08	0.05	0.03	0.02
1.00%	65	43	29	19	13	8.6	5.7	3.8	2.5	1.7	1.1	0.73	0.49	0.33	0.22	0.15	0.10	0.07	0.04
0.50%	131	87	58	38	26	17	11	7.7	5.1	3.4	2.3	1.5	0.98	0.65	0.45	0.30	0.20	0.13	0.08
0.25%	-	175	116	77	52	34	23	15	10	6.9	4.6	2.9	2.0	1.3	0.90	0.60	0.39	0.26	0.16
0.10%	-	-	-	192	131	86	57	38	25	17	11	7.3	4.9	3.3	2.2	1.5	1.0	0.65	0.41
0.05%	-	-	-	-	260	171	114	76	50	34	23	15	9.8	6.5	4.5	3.0	2.0	1.3	0.81
0.01%	-	-	-	-	-	-	560	376	248	168	112	72	48	32	22	15	9.6	6.4	4.0

Approximate number of mg of chemical/kg of body weight on each kernel of wheat*

2.00% = 49.0
1.00% = 24.5
0.50% = 12.3
0.25% = 6.1
0.10% = 2.5
0.05% = 1.2
0.01% = 0.3

*Values are based upon the average weight of seed and 20 gram Peromyscus.

TABLE 2. APPROXIMATE NUMBER OF WHEAT SEED LETHAL TO 25 GRAM SWISS WHITE MICE AT GIVEN CONCENTRATIONS

	APPROXIMATE LD (mg/kg)																		
Conc.	1600	1070	710	470	320	210	140	94	62	42	28	18	12	8	5.5	3.7	2.4	1.6	1
2.00%	41	27	18	12	8.2	5.4	3.6	2.4	1.6	1.1	0.71	0.46	0.31	0.20	0.14	0.09	0.06	0.04	0.03
1.00%	82	55	36	24	16	11	7.1	4.8	3.2	2.1	1.4	0.92	0.61	0.41	0.28	0.19	0.12	0.08	0.05
0.50%	163	109	72	48	33	21	14	9.6	6.3	4.3	2.9	1.8	1.2	0.82	0.56	0.38	0.25	0.16	0.10
0.25%	327	218	145	96	65	43	29	19	13	8.6	5.7	3.7	2.5	1.6	1.1	0.76	0.49	0.33	0.20
0.10%	-	-	-	240	163	107	71	48	32	21	14	9.2	6.1	4.1	2.8	1.9	1.2	0.82	0.51
0.05%	-	-	-	-	-	214	143	96	63	43	29	18	12	8.2	5.6	3.8	2.5	1.6	1.0
0.01%	-	-	-	-	-	-	-	-	-	210	140	90	60	40	28	19	12	8.0	5.0

Approximate number of mg of chemical/kg of body weight on each kernel of wheat*

2.00% = 39.2
1.00% = 19.6
0.50% = 9.8
0.25% = 4.9
0.10% = 2.0
0.05% = 1.0
0.01% = 0.2

*Values are based upon the average weight of seed and 25 gram Swiss White Mice.

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 9

COMPANY CODE ZAC DRC

CONCENTRATION 2% wt.

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	17K	3/1	8K		28
2	25	25	25K		75
3	2	0/3	0		2
4	5	5	0		5
5	24/1	25K	25K		74
TOTAL	73	53	58		184
				PERCENT REDUCTION	50.9

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
14.6	1070	22

COMMENTS: 1070 - 0.66 - 0

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Applied direct

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 13

COMPANY CODE ZAC DRC

CONCENTRATION 0.5% wt.

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	25	25	25		75
2	25	25	25		75
3	24/1	25	25		74
4	25	25	25		75
5	25	25	25		75
TOTAL	124	125	125		374
				PERCENT REDUCTION	0.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
24.8	1070	87

COMMENTS:

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Applied direct

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

ZAC

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 11 CONCENTRATION 2% wt.

COMPANY CODE ZAC DRC DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	23/2	25	25		73
2	17/5	6	[redacted]		23
3	23/2	25	12/11		61
4	10/15	15/10	16/9		41
5	25	25	25		75
TOTAL	98	96	79		273
			PERCENT REDUCTION		22.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
19.6	1070	27

COMMENTS: 1070 - 0.73 - 20

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [x] – OTHER Applied direct

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 15 CONCENTRATION 0.5% wt.

COMPANY CODE ZAC DRC DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	25	25	24/1		74
2	20/5	25	24/1		69
3	25	25	24/1		74
4	25	23/2	23/2		71
5	22/3	25/1	18/7		65
TOTAL	117	123	113		353
			PERCENT REDUCTION		5.9

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
23.4	1070	109

COMMENTS:

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [x] – OTHER Applied direct

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 10

CONCENTRATION 2% wt.

COMPANY CODE ZAC DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	50	50	50		150
2	50	50	50		150
3	49	50	50		149
4	50	50	50		150
5	50	50	50		150
TOTAL	249	250	250		749
				PERCENT REDUCTION	0.1

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
49.8	1070	--

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [x] – OTHER Applied direct

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

COMMENTS:

INVESTIGATOR:

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 12

CONCENTRATION 2% wt.

COMPANY CODE ZAC DRC

DATE PREP. 2/15/63 DATE TESTED 2/25/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	48/2	38/12	40/2		126
2	43/3	50	42/8		135
3	39/11	43/5	47/3		129
4	48/2	50	48/2	[redacted]	146
5	26/12	3/32	11/9	[redacted]	40
TOTAL	204	184	188		576
				PERCENT REDUCTION	23.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
40.8	1070	

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [x] – OTHER Applied direct

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

COMMENTS:

INVESTIGATOR:

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL ZAC DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 2/25/63 TEST DATE 2/25/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 1070 mg. /kg.

FORMULATION: 40 mg. active ingredient/ml. HOH

COMMENTS: _____

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
B3	M 25	1600	1.00	3:10	1st overnight period
4	F 20	1070	0.54		22 hours
5	M 25	710	0.44		
6	F 23	470	0.27		
7	M 20	320	0.16		
8	F 27	140	0.09		2nd overnight period

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

18

TOXICITY RECORD

Denver Wildlife Research Center

ZAC

CHEMICAL ZAC DRC _____ TEST MAMMAL Swiss white--males

FORMULATION DATE 2/25/63 TEST DATE 2/25/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 1070 mg. /kg.

FORMULATION: 40 mg. active ingredient/ml. HOH

COMMENTS: _____

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 13	M 19	1600	0.76	3:10	1st overnight period.
14	M 27	1070	0.72		1st overnight period
15	M 19	710	0.34		
16	M 23	470	0.27		
B 1	M 20	320	0.16		2nd overnight period
2	M 29	140	0.10		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL ZAC BIOASSAY REFERENCE Stan. 9 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 2% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified ____.

FORMULATION:

- ☐ CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- ☒ OTHER Direct

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	73	86	88				100/88

GROWTH RATE AND FORM

Slight	Pronounced	
☐	☐	ABNORMAL FOLIAR DEVELOPMENT.
☐	☐	ABNORMAL ROOT DEVELOPMENT.
☐	☐	ABNORMAL FOLIAR COLORATION.
☒		SEEDLING APPEARED NORMAL.

Comments: ____

Investigator ____

19

FOLIAR PHYTOTOXICITY AND FOLIAR ACCEPTANCE RECORD

Denver Wildlife Research Center

CHEMICAL ZAC DRC ____ APPLICATION DATE 4/24/63

Application Method:

☒ LEAVES SPRAYED UNTIL WELL WETTED. ☐ OTHER ____

Formulation:

- ☐ CHEMICAL SUSPENDED IN 1 PERCENT CARBOPOL SOLUTION.
- ☐ CHEMICAL DISSOLVED IN ACETONE AND COMBINED WITH EMULSIFIER AND WATER.
- ☒ OTHER HOH

Comments: ____

FOLIAR PHYTOTOXICITY

NO. 1	PLANT Bean			CONC: 5%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

NO. 2	PLANT Douglas-fir			CONC: 5%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

NO. 3	PLANT Bean			CONC: 1%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

NO. 4	PLANT Douglas-fir			CONC: 1%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

Legend (Injury): 0 = none; + = slight; ++ = moderate; +++ = severe.

FOLIAR ACCEPTANCE

☒ TREATED SEEDLINGS OFFERED TO: DOMESTIC RABBIT

	NO. 1	NO. 2	NO. 3	NO. 4
SEEDLINGS CONSUMED WITHOUT APPARENT ILL EFFECTS –	☒	☐	☒	☐
SEEDLINGS NOT CONSUMED BY TEST ANIMAL --------	☐	☒	☐	☒
DEATH OF THE TEST ANIMAL ----------	☐	☐	☐	☐

COMMENTS: Estimated percent foliar consumption (treated/control).
No. 1 = 87/100 No. 2 = 20/100 No. 3 = 72/90 No. 4 = 12/20

Investigator ____

ZAC

TMTD

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 1

CONCENTRATION 2% wt.

COMPANY CODE TMTD DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	4	4	0		8
2	19K	2	[redacted]		21
3	8K	4	1		13
4	6	0	1		7
5	6/1	0	0		6
TOTAL	43	10	2		55
				PERCENT REDUCTION	84.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
8.6	1600	33

COMMENTS: 1600 - 0.26 - 20

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Applied direct

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 5

CONCENTRATION 0.5% wt.

COMPANY CODE TMTD DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	20/1	5/1	8		33
2	25	2	17		44
3	22	22	14/3		58
4	25	14	3 [redacted]		42
5	25	25	25		75
TOTAL	117	68	67		252
				PERCENT REDUCTION	32.8

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
23.4	1600	131

COMMENTS:

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Applied direct + 3 ml HOH

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 3

COMPANY CODE TMTD DRC

CONCENTRATION 2% wt.

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	15/1	4/4	0		19
2	10/15	0/5	0		10
3	2	0	0/3		2
4	8/9	2/6	9/6		19
5	4/1	1/1	0/6		5
TOTAL	39	7	9		55
				PERCENT REDUCTION	85.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
7.8	+1600	+41

COMMENTS: 1600 - 0.19 - 0

INVESTIGATOR:

FORMULATION:

- ☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- ☒ – OTHER Applied direct

ACTION RECOMMENDED:

- ☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- ☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - ☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - ☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - ☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - ☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 7

COMPANY CODE TMTD DRC

CONCENTRATION 0.5% wt.

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	25	25	19/6		69
2	20/4	25	23/2		68
3	25	22/3	16/9		63
4	5/20	24/1	5K/9		34
5	25	24/1	19/6		68
TOTAL	100	120	82		302
				PERCENT REDUCTION	19.5

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
20.0	+1600	+163

COMMENTS:

INVESTIGATOR:

FORMULATION:

- ☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- ☒ – OTHER Applied direct +3 ml HOH

ACTION RECOMMENDED:

- ☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- ☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - ☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - ☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - ☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - ☐ – OTHER

TMTD

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 2

CONCENTRATION 2% wt.

COMPANY CODE TMTD DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	49/1	50	50		149
2	50	50	49		149
3	15/1	21	42		78
4	49/1	50	50		149
5	50	49/1	50		149
TOTAL	213	220	241		674
				PERCENT REDUCTION	10.1

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
42.6	1600	--

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Applied direct +3 ml HOH

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

COMMENTS:

INVESTIGATOR:

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 4

CONCENTRATION 2% wt.

COMPANY CODE TMTD DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	11/39	4/46	16/34		31
2	27/22	10/40	36/14		73
3	42/4	43/6	27/5		112
4	27/22	18/17	35/13		80
5	32/17	34/5	4/19		70
TOTAL	139	109	118		366
				PERCENT REDUCTION	51.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
27.8	+1600	--

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Applied direct +3 ml HOH

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

COMMENTS:

INVESTIGATOR:

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL TMTD DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 2/25/63 TEST DATE 2/25/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 1600 mg. /kg.

FORMULATION: 40 mg. active ingredient/ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage X or mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 7	M 24	1600	0.96	3:00	2nd overnight period
8	M 24	1070	0.64		
9	M 20	710	0.36		
10	F 21	470	0.25		
11	F 20	320	0.16		
12	M 22	210	0.12		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL TMTD DRC _____ TEST MAMMAL Swiss white--males

FORMULATION DATE 2/25/63 TEST DATE 2/25/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = +1600 mg. /kg.

FORMULATION: 40 mg. active ingredient/ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage X or mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 1	M 21	1600	0.84	3:00	
2	24	1070	0.64		
3	20	710	0.36		
4	20	470	0.24		
5	24	320	0.19		
6	31	210	0.16		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

TMTD

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL TMTD BIOASSAY REFERENCE Stan. 1 & 3 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 2% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified _____.

FORMULATION:

- ☐ CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- ☒ OTHER Direct

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	47	52	57				100/57

GROWTH RATE AND FORM

Slight	Pronounced	
☐	☐	ABNORMAL FOLIAR DEVELOPMENT.
☐	☐	ABNORMAL ROOT DEVELOPMENT.
☐	☐	ABNORMAL FOLIAR COLORATION.
☒		SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

FOLIAR PHYTOTOXICITY AND FOLIAR ACCEPTANCE RECORD

Denver Wildlife Research Center

CHEMICAL TMTD DRC _____ APPLICATION DATE 4/24/63

Application Method:

☒ LEAVES SPRAYED UNTIL WELL WETTED. ☐ OTHER _____

Formulation:

- ☒ CHEMICAL SUSPENDED IN 1 PERCENT CARBOPOL SOLUTION.
- ☐ CHEMICAL DISSOLVED IN ACETONE AND COMBINED WITH EMULSIFIER AND WATER.
- ☐ OTHER _____

Comments: _____

FOLIAR PHYTOTOXICITY

NO. 1	PLANT Bean			CONC: 5%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

NO. 2	PLANT Douglas-fir			CONC: 5%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

NO. 3	PLANT Bean			CONC: 1%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

NO. 4	PLANT Douglas-fir			CONC: 1%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	0	0	0		

Legend (Injury): 0 = none; + = slight; ++ = moderate; +++ = severe.

FOLIAR ACCEPTANCE

☒ TREATED SEEDLINGS OFFERED TO: DOMESTIC RABBIT

	NO. 1	NO. 2	NO. 3	NO. 4
SEEDLINGS CONSUMED WITHOUT APPARENT ILL EFFECTS –	☐	☐	☐	☐
SEEDLINGS NOT CONSUMED BY TEST ANIMAL ---------	☒	☒	☒	☒
DEATH OF THE TEST ANIMAL ----------	☐	☐	☐	☐

COMMENTS: Estimated percent foliar consumption (treated/control)
No. 1 = 0/80 No. 2 = 1/95 No. 3 = 15/100 No. 4 = 0/90

Investigator _____

TMTD

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 17

CONCENTRATION 2% wt.

COMPANY CODE Beta-nitrostyrene DRC _____

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	0	0	0		0
2	1	0	0		1
3	0	1	0		1
4	0	0	0		0
5	1	0	0		1
TOTAL	2	1	0		3
				PERCENT REDUCTION	99.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
0.4	710	15

COMMENTS: 710 - 0.03 - 0

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 21

CONCENTRATION 0.5% wt.

COMPANY CODE Beta-nitrostyrene DRC _____

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	12/3	11K/2	25K		48
2	4	2	6		12
3	1/4	0	0		1
4	2/1	0	2K		4
5	21/4	6	3	[redacted]	30
TOTAL	40	19	36		95
				PERCENT REDUCTION	74.7

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
8.0	710	58

COMMENTS: 710 - 0.14 - 20

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

Beta-nitrostyrene

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 19

CONCENTRATION 2% wt.

COMPANY CODE Beta-nitrostyrene DRC _____

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	1	0/2	1		2
2	0	0	0		0
3	0	0	0		0
4	0	0/3	1/2		1
5	0	1	0		1
TOTAL	1	1	2		4
				PERCENT REDUCTION	98.9

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
0.2	710	18

COMMENTS: 710 - 0.01 - 0

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 23

CONCENTRATION 0.5% wt.

COMPANY CODE Beta-nitrostyrene DRC _____

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	2/1	0	0		2
2	2	0/1	0/2		2
3	0/2	4/4	16		20
4	3	0/4	1		4
5	1	0/1	3		4
TOTAL	8	4	20		32
				PERCENT REDUCTION	91.5

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
1.6	710	72

COMMENTS: 710 - 0.02 - 0

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 18

CONCENTRATION 2% wt.

COMPANY CODE Beta-nitrostyrene DRC _____

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	49/1	50	50		149
2	50	42	50		142
3	50	48	49		147
4	50	50	50		150
5	50	50	50		150
TOTAL	249	240	249		738
				PERCENT REDUCTION	1.6

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
49.8	710	--

COMMENTS: _____

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 20

CONCENTRATION 2% wt.

COMPANY CODE Beta-nitrostyrene DRC _____

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	3/2	3/7	10/4		16
2	7/10	4/10	7/8		18
3	5/8	11/3	4/12		20
4	4/14	8/7	12/10		24
5	6/8	7/4	11/10		24
TOTAL	25	33	44		103
				PERCENT REDUCTION	86.4

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
5.0	710	--

COMMENTS: _____

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Beta-nitrostyrene DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 2/25/63 TEST DATE 2/26/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 710 mg. /kg.

FORMULATION: 40 ml. active ingredient/ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
C 35	F 21	1600	0.84	1:00	1st overnight period
36	M 17	1070	0.45		1st overnight period
37	F 21	710	0.37		1st overnight period
38	M 21	470	0.25		
39	M 23	320	0.18		
40	M 27	140	0.09		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Beta-nitrostyrene DRC _____ TEST MAMMAL Swiss white--males

FORMULATION DATE 2/25/63 TEST DATE 2/26/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 710 mg. /kg.

FORMULATION: 40 mg. active ingredient/ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
C 29	21	1600	0.84	1:00	2 hours
30	20	1070	0.54		2 hours
31	21	710	0.37		1st overnight period
32	26	470	0.31		
33	21	320	0.17		
34	29	140	0.10		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

Beta-nitrostyrene

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Beta-nitrostyrene BIOASSAY REFERENCE Stan. 17 &19 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 2% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified _____.

FORMULATION:

- [x] CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- [ ] OTHER _____

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	0	0	0				100/0

GROWTH RATE AND FORM

Slight	Pronounced	
[ ]	[ ]	ABNORMAL FOLIAR DEVELOPMENT.
[ ]	[ ]	ABNORMAL ROOT DEVELOPMENT.
[ ]	[ ]	ABNORMAL FOLIAR COLORATION.
	[ ]	SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

FOLIAR PHYTOTOXICITY AND FOLIAR ACCEPTANCE RECORD

Denver Wildlife Research Center

CHEMICAL Beta-nitrostyrene DRC _____ APPLICATION DATE 4/24/63

Application Method:

- [x] LEAVES SPRAYED UNTIL WELL WETTED.
- [ ] OTHER _____

Formulation:

- [x] CHEMICAL SUSPENDED IN 1 PERCENT CARBOPOL SOLUTION.
- [ ] CHEMICAL DISSOLVED IN ACETONE AND COMBINED WITH EMULSIFIER AND WATER.
- [ ] OTHER _____

Comments: _____

FOLIAR PHYTOTOXICITY

NO. 1	PLANT Bean			CONC: 5%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	++	+++	+++		

NO. 2	PLANT Douglas-fir			CONC: 5%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	++	+++	+++		

NO. 3	PLANT Bean			CONC: 1%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	++	+++	+++		

NO. 4	PLANT Douglas-fir			CONC: 1%	
DATE	4/26	4/28	4/30		
CONTROL	0	0	0		
TREATED	+	++	++		

Legend (Injury): 0 = none; + = slight; ++ = moderate; +++ = severe.

FOLIAR ACCEPTANCE

[x] TREATED SEEDLINGS OFFERED TO: DOMESTIC RABBIT

	NO. 1	NO. 2	NO. 3	NO. 4
SEEDLINGS CONSUMED WITHOUT APPARENT ILL EFFECTS –	[ ]	[ ]	[x]	[ ]
SEEDLINGS NOT CONSUMED BY TEST ANIMAL --------	[x]	[x]	[ ]	[x]
DEATH OF THE TEST ANIMAL ----------	[ ]	[ ]	[ ]	[ ]

COMMENTS: Estimated percent foliar consumption (treated/control)
No. 1 = 0/100 No. 2 = 0/60 No. 3 = 100/100 No. 4 = 20/70

Investigator _____

Beta-nitrostyrene

TNB-A

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 57

CONCENTRATION 2% wt.

COMPANY CODE TNB-A DRC

DATE PREP. 5/3/63 DATE TESTED 5/6/63

CARRIER Wheat TEST ANIMAL Peromyscus

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER plyac adhesive used

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	1	1	3		5
2	2	2	1		5
3	2	0	1		3
4	3	0	0/2		3
5	3	3	2		8
TOTAL	11	6	7		24
				PERCENT REDUCTION	93.6

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
2.2	1070	22

COMMENTS: 1070 - 0.10 - 0

INVESTIGATOR:

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 59

CONCENTRATION 0.5% wt.

COMPANY CODE TNB-A DRC

DATE PREP. 5/3/63 DATE TESTED 5/6/63

CARRIER Wheat TEST ANIMAL Peromyscus

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	6/2	3	3		12
2	0	0	1/1		1
3	5	3	0		8
4	2	1	3		6
5	6	2	5		13
TOTAL	19	9	12		40
				PERCENT REDUCTION	89.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
3.8	1070	87

COMMENTS: 1070 - 0.04 - 0

INVESTIGATOR:

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 58

COMPANY CODE TNB-A DRC

CONCENTRATION 2% wt.

DATE PREP. 5/3/63 DATE TESTED 5/13/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	1	0/12	0	[redacted]	1
2	5/3	8/2	1/4		14
3	2/6	1/2	4		7
4	5	[redacted]			5
5	2	0	7		9
TOTAL	15	9	12		36
				PERCENT REDUCTION	88.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
3.0	710	18

COMMENTS: 710 - 0.17 - 40

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER Adhesive plyac used

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 60

COMPANY CODE TNB-A DRC

CONCENTRATION 0.5% wt.

DATE PREP. 5/3/63 DATE TESTED 5/13/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	0/5	8/2	23/2		31
2	1	0	0		1
3	3/1	0	2		5
4	0	0/1	0/1		0
5	7	16	15		38
TOTAL	11	24	40		75
				PERCENT REDUCTION	80.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
2.2	710	72

COMMENTS: 710 - 0.03 - 0

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

TNB-A

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 54 CONCENTRATION 2% wt.

COMPANY CODE TNB-A DRC _____ DATE PREP. 5/3/63 DATE TESTED 5/6/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	50	50	50		150
2	50	50	41		141
3	50	50	50		150
4	50	50	50		150
5	50	50	50		150
TOTAL	250	250	241		741
				PERCENT REDUCTION	1.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
50.0	1070	--

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

COMMENTS: _____

INVESTIGATOR: _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 53 CONCENTRATION 2% wt.

COMPANY CODE TNB-A DRC _____ DATE PREP. 5/3/63 DATE TESTED 5/13/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	25	15	6/14		46
2	13/6	50	25/21		88
3	24/10	12/30	28/18		64
4	8	10/15	21/10		39
5	35/15	8/20	7/18		50
TOTAL	105	95	87		287
				PERCENT REDUCTION	61.7

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
21.0	710	--

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

COMMENTS: _____

INVESTIGATOR: _____

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL TNB-A DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 5/10/63 TEST DATE 5/13/63 OBSERVATION PERIOD 3 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 1070 mg. /kg.

FORMULATION: Suspension of 40 mg. chemical per ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage X or mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
B 1	F 17	1600	0.68	5/13/63 10:20	2nd overnight period
2	F 20	710	0.36		
3	F 18	320	0.14		
A 2	M 22	1070	0.59	5/15/63 7:50	1st overnight period

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL TNB-A DRC _____ TEST MAMMAL Swiss white

FORMULATION DATE 5/10/63 TEST DATE 5/13/63 OBSERVATION PERIOD 3 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 710 mg. /kg.

FORMULATION: Suspension of 40 mg. chemical per ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage X or mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
B 16	M 23	1600	0.92	5/13/63 11:50	Within 2 hours
C 1	M 26	710	0.48		Within 2 hours
2	M 27	320	0.22		
C 10	M 27	470	0.32		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

TNB-A

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL TNB-A BIOASSAY REFERENCE Stan. 57&58 DATE PREPARED 5/3/63

SEED Wheat DATE PLANTED 5/10/63 CHEMICAL CONCENTRATION 2% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified _____; Stratified _____.

FORMULATION:

- ☐ CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- ☐ OTHER _____

GERMINATION RESULTS

DATE	5/15	5/20	5/23				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	0	0	0				100/0

GROWTH RATE AND FORM

Slight	Pronounced	
☐	☐	ABNORMAL FOLIAR DEVELOPMENT.
☐	☐	ABNORMAL ROOT DEVELOPMENT.
☐	☐	ABNORMAL FOLIAR COLORATION.
	☐	SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

34

FOLIAR PHYTOTOXICITY AND FOLIAR ACCEPTANCE RECORD

Denver Wildlife Research Center

TNB-A

CHEMICAL TNB-A DRC _____ APPLICATION DATE 6/15/63

Application Method:

- ☒ LEAVES SPRAYED UNTIL WELL WETTED.
- ☐ OTHER _____

Formulation:

- ☐ CHEMICAL SUSPENDED IN 1 PERCENT CARBOPOL SOLUTION.
- ☒ CHEMICAL DISSOLVED IN ACETONE AND COMBINED WITH EMULSIFIER AND WATER.
- ☐ OTHER _____

Comments: _____

FOLIAR PHYTOTOXICITY

NO. 1	PLANT Bean			CONC: 5%	
DATE	6/10	6/11	6/12	6/17	6/19
CONTROL	0	0	0	0	0
TREATED	+	+	++*	++*	++*

NO. 2	PLANT Douglas-fir			CONC: 5%	
DATE	6/10	6/11	6/12	6/17	6/19
CONTROL	0	0	0	0	0
TREATED	0	+	++	++	++

NO. 3	PLANT Bean			CONC: 1%	
DATE	6/26	6/28	7/1	7/5	
CONTROL	0	0	0	0	
TREATED	0	<+	++**	+++**	

NO. 4	PLANT Douglas-fir			CONC: 1%	
DATE	6/26	6/28	7/1	7/5	
CONTROL	0	0	0	0	
TREATED	0	0	<+	+	

Legend (Injury): 0 = none; + = slight; ++ = moderate; +++ = severe.

FOLIAR ACCEPTANCE

☒ TREATED SEEDLINGS OFFERED TO: DOMESTIC RABBIT

	NO. 1	NO. 2	NO. 3	NO. 4
SEEDLINGS CONSUMED WITHOUT APPARENT ILL EFFECTS --	☐	☐	☐	☐
SEEDLINGS NOT CONSUMED BY TEST ANIMAL --------	☒	☒	☐	☐
DEATH OF THE TEST ANIMAL ----------	☐	☐	☐	☐

COMMENTS: *Old leaves only. Plant No. 1--25% treated consumed; 100% control consumed. Plant No. 2--50% treated consumed; 100% control consumed.
**Old leaves only. New growth not affected.

Investigator _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 34

CONCENTRATION 1% wt.

COMPANY CODE Endrin DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD -- DAYS	TOTAL SEED
1	1	[redacted]			1
2	2/1				2
3	2				2
4	1				1
5	4				4
TOTAL	10				10
				PERCENT REDUCTION	92.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
2.0	12	0.49

COMMENTS: 12 - 4.1 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 41

CONCENTRATION .1% wt.

COMPANY CODE Endrin DRC

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	5/5	[redacted]			5
2	3				3
3	5				5
4	9				9
5	4				4
TOTAL	26				26
				PERCENT REDUCTION	79.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
5.2	12	4.9

COMMENTS: 12 - 1.1 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

Endrin

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 36

COMPANY CODE Endrin DRC

CONCENTRATION 1% wt.

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	0	0/1	0		0
2	4/1	[redacted]			4
3	8	[redacted]			8
4	7/1	[redacted]			7
5	5	[redacted]			5
TOTAL	24				24
				PERCENT REDUCTION	86.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
4.8	8	0.41

COMMENTS: 8 - 11.7 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 42

COMPANY CODE Endrin DRC

CONCENTRATION .1% wt.

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	7K	[redacted]			7
2	15/2	[redacted]			15
3	24K	[redacted]			24
4	16/7	3/5	3/3		22
5	13	[redacted]			13
TOTAL	75	3	3		81
				PERCENT REDUCTION	53.7

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
15.0	8	4.1

COMMENTS: 8 - 3.7 - 80

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 35 CONCENTRATION 1% wt.

COMPANY CODE Endrin DRC _____ DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	26	7/3	1/2	[redacted]	34
2	23	0	0		23
3	41/2	[redacted]			41
4	5	0/1	1		6
5	8/4	[redacted]			8
TOTAL	103	7	2		112
				PERCENT REDUCTION	79.6

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
20.6	12	--

COMMENTS: _____

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 33 CONCENTRATION 1% wt.

COMPANY CODE Endrin DRC _____ DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	9	[redacted]			9
2	28/8	[redacted]			28
3	24/17	12/30	30/17		66
4	34/12	0/9	0	[redacted]	34
5	15/5	[redacted]			15
TOTAL	110	12	30		152
				PERCENT REDUCTION	66.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
22.0	8	--

COMMENTS: _____

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Endrin DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 2/13/63 TEST DATE 2/13/63 OBSERVATION PERIOD 3 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 12 mg. /kg.

FORMULATION: 0.10 gram of 50W in 100 ml. HOH = 0.5 mg/ml

COMMENTS: _____

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 1	M 23	18	0.83	2:30	1 hour
2	M 26	12	0.62		1st overnight period
3	M 21	8	0.34		
4	M 26	5.5	0.29		
5	M 19	3.7	0.14		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Endrin DRC _____ TEST MAMMAL White mice--females

FORMULATION DATE 2/13/63 TEST DATE 2/13/63 OBSERVATION PERIOD 3 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 8 mg. /kg.

FORMULATION: 1 gram 50W Endrin ground with 1 gram Acacia gum suspended in water.

5 mg/ml.* 1 mg/ml.** 0.5 mg/ml.***

COMMENTS: _____

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 1	F 31	42	0.260*	3:10	1st overnight period
2	F 28	28	0.784**		1st overnight period
3	F 28	18	0.504**		1st overnight period
4	F 29	12	0.348**		1st overnight period
5	F 27	8	0.216**		1st overnight period
6	F 30	5.5	0.165**		
7	F 33	3.7	0.24***		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Endrin BIOASSAY REFERENCE Stan. 34&36 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 1% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified _____.

FORMULATION:

- [x] CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- [ ] OTHER _____

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	87	93	97				100/97

GROWTH RATE AND FORM

Slight	Pronounced	
[ ]	[ ]	ABNORMAL FOLIAR DEVELOPMENT.
[ ]	[ ]	ABNORMAL ROOT DEVELOPMENT.
[ ]	[ ]	ABNORMAL FOLIAR COLORATION.
[x]		SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

1080

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 25

CONCENTRATION 1% wt.

COMPANY CODE 1080 DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD - DAYS	TOTAL SEED
1	6				6
2	3				3
3	7				7
4	3/1				3
5	7				7
TOTAL	26				26
				PERCENT REDUCTION	79.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
5.2	5.5	0.22

COMMENTS: Sample 987 5.5 - 23.6 - 100

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [x] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [ ] – OTHER

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 69

CONCENTRATION 0.05% wt.

COMPANY CODE 1080 DRC

DATE PREP. 8/9/63 DATE TESTED 8/12/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD DAYS	TOTAL SEED
1	6/1				6
2	3	0	0		3
3	3	1			4
4	2				2
5	5/2	0			5
TOTAL	19	1	0		20
				PERCENT REDUCTION	91.1

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
3.8	5.5	4.5

COMMENTS: 5.5 - 0.8 - 40

Sample 987

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [x] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [ ] – OTHER

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 27

CONCENTRATION 1% wt.

COMPANY CODE 1080 DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	2				2
2	4				4
3	6/1	1	4/3		11
4	20K/1	4K			24
5	4				4
TOTAL	36	5	4		45
				PERCENT REDUCTION	77.5

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
7.2	12	0.61

COMMENTS: Sample 987 12 - 11.8 - 80

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [x] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [ ] – OTHER

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 44

CONCENTRATION .1% wt.

COMPANY CODE 1080 DRC

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	25K	10	0		35
2	22K	12/10	9/7		43
3	19	0	0		19
4	17	3	9/2		29
5	23K	6	7		36
TOTAL	106	31	25		162
				PERCENT REDUCTION	56.8

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
21.2	12	6.1

COMMENTS: 12 - 3.5 - 0

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [x] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [ ] – OTHER

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

1080

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 26

CONCENTRATION 1% wt.

COMPANY CODE 1080 DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	48/3	4/2	3		55
2	25/3	1/0	0		26
3	30/0	4/0	0		34
4	47/3	[redacted]			47
5	28/2	0/1	1	[redacted]	29
TOTAL	178	9	4		191
				PERCENT REDUCTION	70.6

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
35.6	5.5	--

COMMENTS: Sample 987

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [x] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [ ] – OTHER

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 28

CONCENTRATION 1% wt.

COMPANY CODE 1080 DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	24/1	[redacted]			24
2	42K/8	4/36	11		57
3	40K/10	0/1	2/1		42
4	14/3	22/21	12/3		48
5	34K/4	[redacted]			34
TOTAL	154	26	25		205
				PERCENT REDUCTION	62.7

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
30.8	12	--

COMMENTS: Sample 987

INVESTIGATOR:

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [x] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [ ] – OTHER

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL 1080 DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 2/25/63 TEST DATE 2/25/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 5.5 mg. /kg.

FORMULATION: 0.10 gram in HOH to make 100 ml. solution.

1 mg/ml. *New solution 0.5 mg/ml.

COMMENTS: Sample 987

Animal No.	Sex and Weight	Dosage Mor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
B 15	F 19	12	0.23	3:30	1st overnight period
16	F 17	8	0.14		1st overnight period
C 1	M 20	5.5	0.11		1st overnight period
2	M 19	3.7	0.07		
3	M 21	2.4	0.05		
4	M 20	1.6	0.032		
A 1	F 23	12	0.55*	2/28 9:00	6 hours
2	M 19	8	0.30*		1st overnight period
3	M 22	5.5	0.24*		
4	F 20	3.7	0.15*		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

43

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL 1080 DRC _____ TEST MAMMAL Swiss white--males

FORMULATION DATE 2/25/63 TEST DATE 2/25/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 12 mg. /kg.

FORMULATION: 0.10 gram in HOH to make 100 ml. solution.

1 mg/ml. *New preparation 0.5 mg/kg.

COMMENTS: Sample 987

Animal No.	Sex and Weight	Dosage Mor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
B 9	M 19	12	0.23	3:30	1st overnight period
10	M 32	8	0.26		
11	M 26	5.5	0.14		
12	M 16	3.7	0.06		
13	M 22	2.4	0.05		
14	M 20	1.6	0.032		
A 5	M 30	12	0.72	2/28 9:00	1st overnight period
6	M 31	8	0.50		
7	M 26	5.5	0.29		
8	M 28	3.7	0.21		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

1080

1080

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL 1080 BIOASSAY REFERENCE Stan. 27 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 1% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified _____.

FORMULATION:

- ☐ CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- ☒ OTHER HOH
  Sample 987

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100 / 96
TREATED	10	58	69				100 / 69

GROWTH RATE AND FORM

Slight	Pronounced	
☐	☐	ABNORMAL FOLIAR DEVELOPMENT.
☐	☐	ABNORMAL ROOT DEVELOPMENT.
☐	☐	ABNORMAL FOLIAR COLORATION.
☒		SEEDLING APPEARED NORMAL.

Comments: Reduced vigor

Investigator _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 29

CONCENTRATION 1% wt.

COMPANY CODE Strychnine DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD ____ DAYS	TOTAL SEED
1	5	[redacted]			5
2	1				1
3	3/1				3
4	1				1
5	1/1				1
TOTAL	11				11
				PERCENT REDUCTION	91.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
2.2	12	0.49

COMMENTS: 12 - 4.5 - 100

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Chloroform

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 45

CONCENTRATION .1% wt.

COMPANY CODE Strychnine DRC

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	9	[redacted]			9
2	24/1	24/1	25		73
3	25	25	25		75
4	8				8
5	25	25	25		75
TOTAL	91	74	75		240
				PERCENT REDUCTION	12.7

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
18.2	12	4.9

COMMENTS: 12 - 3.7 - 40

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Heated benzene

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

Strychnine

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 31

CONCENTRATION 1% wt.

COMPANY CODE Strychnine DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD -- DAYS	TOTAL SEED
1	2/1	[redacted]			2
2	1/1	[redacted]			1
3	4/8	[redacted]			4
4	1/3	[redacted]			1
5	1/1	3	[redacted]		4
TOTAL	9	3			12
				PERCENT REDUCTION	92.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
1.8	28	1.4

COMMENTS: 28 - 1.3 - 100

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Chloroform

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 46

CONCENTRATION 0.25% wt.

COMPANY CODE Strychnine DRC

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	23/2	25	16	[redacted]	64
2	9	[redacted]			9
3	7	[redacted]			7
4	9/2	[redacted]			9
5	3	[redacted]			3
TOTAL	51	25	16		92
				PERCENT REDUCTION	47.4

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
10.2	28	5.7

COMMENTS: 28 - 1.8 - 100

INVESTIGATOR:

FORMULATION:

☐ – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

☐ – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

☒ – OTHER Heated benzene

ACTION RECOMMENDED:

☐ – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

☐ – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

☐ – COMPOUND IS A POORLY ACCEPTED TOXICANT

☐ – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

☐ – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

☐ – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 30

CONCENTRATION 1% wt.

COMPANY CODE Strychnine DRC

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	12/2	1	11		24
2	42	42	21/1		105
3	50	42/2	1/1		93
4	48/2	49	50		147
5	49	42/1	3		94
TOTAL	201	176	86		463
				PERCENT REDUCTION	38.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
40.2	12	--

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [x] – OTHER Chloroform

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

COMMENTS:

INVESTIGATOR:

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 32

CONCENTRATION 1% wt.

COMPANY CODE Strychnine DRC

DATE PREP. 2/15/63 DATE TESTED 2/25/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	47/3	14/21	10/8		71
2	25/24	28/13	36/14	[redacted]	89
3	44/6	49/1	30/12	[redacted]	123
4	10/9	4/2	1/3		15
5	34/16	46/4	46	[redacted]	126
TOTAL	160	141	123		424
				PERCENT REDUCTION	43.5

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
32.0	28	--

FORMULATION:

- [ ] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.
- [x] – OTHER Chloroform

ACTION RECOMMENDED:

- [ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.
- [ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:
  - [ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT
  - [ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.
  - [ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND
  - [ ] – OTHER

COMMENTS:

INVESTIGATOR:

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Strychnine DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 2/25/63 TEST DATE 2/26/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 12 mg./kg.

FORMULATION: 0.10 gram dissolved in chloroform, placed into corn oil, solvent evaporated; 100 ml. solution prepared.

COMMENTS: 1 mg/ml. solution

Animal No.	Sex and Weight	Dosage ml or mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
22	M 19	28	0.53	12:35	30 min.
23	F 19	18	0.34		30 min.
24	M 21	12	0.25		30 min.
25	M 21	8	0.17		
26	M 23	5.5	0.13		
27	M 24	3.7	0.09		
28	F 32	2.4	0.08		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Strychnine DRC _____ TEST MAMMAL Swiss white--males

FORMULATION DATE 2/25/63 TEST DATE 2/26/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 28 mg./kg.

FORMULATION: 0.10 gram dissolved in chloroform, placed into corn oil, solvent evaporated; 100 ml. solution prepared.

COMMENTS: 1 mg/ml solution

Animal No.	Sex and Weight	Dosage ml or mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
C15	M 21	28	0.59	12:35	30 min.
16	26	18	0.47		
17	19	12	0.23		
18	27	8	0.22		
19	27	5.5	0.15		
20	22	3.7	0.08		
21	28	2.4	0.067		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Strychnine BIOASSAY REFERENCE Stan. 29&31 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 1% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified _____.

FORMULATION:

- ☐ CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- ☐ CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- ☒ OTHER Chloroform

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	81	85	89				100/89

GROWTH RATE AND FORM

Slight	Pronounced	
☐	☐	ABNORMAL FOLIAR DEVELOPMENT.
☐	☐	ABNORMAL ROOT DEVELOPMENT.
☐	☐	ABNORMAL FOLIAR COLORATION.
☐		SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

DRC 714

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 37

CONCENTRATION 1% wt.

COMPANY CODE Coded DRC 714

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD -- DAYS	TOTAL SEED
1	3				3
2	4				4
3	3				3
4	6				6
5	5K				5
TOTAL	21				21
				PERCENT REDUCTION	83.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
4.2	18	0.73

COMMENTS: 18 - 5.8 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 61

CONCENTRATION 0.15% wt.

COMPANY CODE Coded DRC 714

DATE PREP. 7/19/63 DATE TESTED 7/22/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	17				17
2	12				12
3	8				8
4	16K				16
5	19				19
TOTAL	72				72
				PERCENT REDUCTION	42.4

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
14.4	18	4.9

COMMENTS: 18 - 2.9 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 39

CONCENTRATION 1% wt.

COMPANY CODE Coded DRC 714

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD -- DAYS	TOTAL SEED
1	17/1				17
2	7/1				7
3	8/1				8
4	11/1				11
5	2/2				2
TOTAL	45				45
				PERCENT REDUCTION	64.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
9.0	12	0.61

COMMENTS: 12 - 14.8 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 48

CONCENTRATION .1% wt.

COMPANY CODE Coded DRC 714

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD -- DAYS	TOTAL SEED
1	21/4				21
2	21/4				21
3	25				25
4	25				25
5	25				25
TOTAL	117				117
				PERCENT REDUCTION	6.4

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
23.4	12	6.1

COMMENTS: 12 - 3.8 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

DRC 714

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 38

COMPANY CODE Coded DRC 714

CONCENTRATION 1% wt.

DATE PREP. 2/15/63 DATE TESTED 2/18/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	46/1	36/3	9		91
2	49/1	50	50		149
3	50	1	1		52
4	50	50	40		140
5	46/3	19	48		113
TOTAL	241	156	148		545
				PERCENT REDUCTION	27.3

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
48.2	18	---

COMMENTS:

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 40

COMPANY CODE Coded DRC 714

CONCENTRATION 1% wt.

DATE PREP. 2/15/63 DATE TESTED 2/25/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	47/3	46/4	40/10		133
2	49/1	34/6	25/5		108
3	7/31	1/38	2/4		10
4	43/7	33/17	44/6		120
5	0/3	[redacted]			0
TOTAL	146	114	111		371
				PERCENT REDUCTION	42.9

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
29.2	12	--

COMMENTS:

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL DRC-714* DRC 714 TEST MAMMAL Peromyscus

FORMULATION DATE 2/25/63 TEST DATE 2/26/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 18 mg. /kg.

FORMULATION: 0.10 gram dissolved in acetone, placed into corn oil, acetone evaporated; 100 ml. solution prepared.

COMMENTS: 1 mg/ml *2nd sample received

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
C 10	M 27	18	0.49	12:30	1st overnight period
11	M 25	12	0.30		
12	M 27	8	0.22		
13	M 27	5.5	0.15		
14	F 29	3.7	0.11		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL DRC-714* DRC 714 TEST MAMMAL Swiss white--males

FORMULATION DATE 2/25/63 TEST DATE 2/26/63 OBSERVATION PERIOD 2 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 12 mg /kg.

FORMULATION: 0.10 gram dissolved in acetone, placed into corn oil, acetone evaporated; 100 ml. solution prepared.

COMMENTS: 1 mg/ml *2nd sample received.

Animal No.	Sex and Weight	Dosage λor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
C 5	25	18	0.43	12:30	1st overnight period
6	30	12	0.36		2nd overnight period
7	39	8	0.31		
8	24	5.5	0.13		
9	25	3.7	0.09		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

DRC 714

DRC 714

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL DRC-714 BIOASSAY REFERENCE Stan. 37&39 DATE PREPARED 2/15/63

SEED Wheat DATE PLANTED 2/20/63 CHEMICAL CONCENTRATION 1% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified x ; Stratified _____.

FORMULATION:

- [x] CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- [ ] OTHER _____

GERMINATION RESULTS

DATE	2/25	2/28	3/4				PLANTED/GERMINATED
CONTROL	94	96	96				100/96
TREATED	71	88	89				100/89

GROWTH RATE AND FORM

Slight	Pronounced	
[ ]	[ ]	ABNORMAL FOLIAR DEVELOPMENT.
[ ]	[ ]	ABNORMAL ROOT DEVELOPMENT.
[ ]	[ ]	ABNORMAL FOLIAR COLORATION.
[x]		SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 70 CONCENTRATION 1% wt.

COMPANY CODE Tetramine DRC _____ DATE PREP. 8/9/63 DATE TESTED 8/12/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD ____ DAYS	TOTAL SEED
1	5/6	[redacted]			5
2	3/13	[redacted]			3
3	1/3	[redacted]			1
4	1/6	[redacted]			1
5	1/1	[redacted]			1
TOTAL	11				11
				PERCENT REDUCTION	91.2

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
2.2	1.6	0.07

COMMENTS: 1.6 - 31.4 - 100

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 49 CONCENTRATION .01% wt.

COMPANY CODE Tetramine DRC _____ DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	2	5	7/1	[redacted]	14
2	5	9	[redacted]		14
3	6	2	[redacted]		8
4	16	[redacted]			16
5	8	2	1		11
TOTAL	37	18	8		63
				PERCENT REDUCTION	77.1

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
7.4	1.6	6.4

COMMENTS: 1.6 - 1.16 - 80

INVESTIGATOR: _____

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER _____

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER _____

Tetramine

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 71

COMPANY CODE Tetramine DRC

CONCENTRATION 1% wt.

DATE PREP. 8/9/63 DATE TESTED 8/12/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD ___ DAYS	TOTAL SEED
1	0				0
2	0				0
3	1				1
4	1				1
5	0				0
TOTAL	2				2
				PERCENT REDUCTION	98.4

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
0.4	0.5	0.015

COMMENTS: 0.5 - 26.7 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 50

COMPANY CODE Tetramine DRC

CONCENTRATION 0.005% wt.

DATE PREP. 4/19/63 DATE TESTED 4/22/63

CARRIER Wheat TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 3 DAYS	TOTAL SEED
1	6				6
2	13/3				13
3	1/2	7			8
4	5	2			7
5	5				5
TOTAL	30	9			39
				PERCENT REDUCTION	77.7

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
6.0	0.5	5.0

COMMENTS: 0.5 - 1.2 - 100

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 73

COMPANY CODE Tetramine DRC

CONCENTRATION 1% wt.

DATE PREP. 8/9/63 DATE TESTED 8/12/63

CARRIER Douglas-fir TEST ANIMAL Peromyscus

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	35	5/43	[redacted]		40
2	5	4/8	[redacted]		9
3	20	[redacted]			20
4	47	[redacted]			47
5	33/2	[redacted]			33
TOTAL	140	9			149
				PERCENT REDUCTION	57.4

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
28.0	1.6	

COMMENTS:

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

BIOASSAY RECORD

Denver Wildlife Research Center

TEST NO. Standard 71

COMPANY CODE Tetramine DRC

CONCENTRATION 1% wt.

DATE PREP. 8/9/63 DATE TESTED 8/12/63

CARRIER Douglas-fir TEST ANIMAL Swiss white

ANIMAL NUMBER	DAILY ACCEPTANCE 1	2	3	OBSERVATION PERIOD 4 DAYS	TOTAL SEED
1	13/2	[redacted]			13
2	4/2	[redacted]			4
3	4/14	[redacted]			4
4	6/1	[redacted]			6
5	8/1	[redacted]			8
TOTAL	35				35
				PERCENT REDUCTION	86.0

Average No. Seed Consumed First Day	Approximate LD mg/kg	Approx. No. Seed Lethal
7.0	0.5	

COMMENTS:

INVESTIGATOR:

FORMULATION:

[x] – CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.

[ ] – CHEMICAL DISSOLVED IN WATER AND APPLIED TO SEED.

[ ] – OTHER

ACTION RECOMMENDED:

[ ] – COMPOUND IS SUFFICIENTLY ACTIVE TO WARRANT FURTHER TESTING.

[ ] – INSUFFICIENT ACTIVITY TO WARRANT FURTHER TESTING OR COMPOUND IS PLACED INACTIVE BECAUSE:

[ ] – COMPOUND IS A POORLY ACCEPTED TOXICANT

[ ] – INADEQUATE MARGIN OF SAFETY BETWEEN AVOIDANCE AND LETHAL LEVEL PRECLUDING USE AS REPELLENT.

[ ] – USE AS FIELD RODENTICIDE DOUBTFUL DUE TO RATHER LOW TOXICITY OF COMPOUND

[ ] – OTHER

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Tetramine DRC _____ TEST MAMMAL Peromyscus

FORMULATION DATE 8/19/63 TEST DATE 8/19/63 OBSERVATION PERIOD 3 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 1.6 mg. /kg.

FORMULATION: Suspension of 0.05 mg. chemical per ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage Xor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 1	F 16	3.7	1.18	12:10	1 hour
2	M 22	2.4	1.06		40 min.
3	M 20	1.6	0.64		2nd overnight period
4	F 17	1.0	0.34		
5	F 20	.7	0.28		
6	F 16	.5	0.16		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

TOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Tetramine DRC _____ TEST MAMMAL Swiss white

FORMULATION DATE 8/19/63 TEST DATE 8/19/63 OBSERVATION PERIOD 3 DAYS

TYPE OF ADMINISTRATION Oral APPROXIMATE LD = 0.5 mg. /kg.

FORMULATION: Suspension of 0.05 mg. per ml. corn oil

COMMENTS: _____

Animal No.	Sex and Weight	Dosage Xor mg/kg	Actual Dosage (ml)	Time of Admin.	TIME OF DEATH
A 7	M 20	3.7	1.48	12:15	20 min.
8	M 20	2.4	0.96		20 min.
9	M 23	1.6	0.74		1 hour
10	M 18	1.0	0.36		35 min.
11	M 23	.7	0.32		35 min.
12	M 23	.5	0.23		1st overnight period
13	M 23	.33	0.15		

Method employed as described by Wm. Deichman and T. LeBlanc in the Journal of Industrial Hygiene and Toxicology, Vol. 25, No. 9, pp. 415-417.

Investigator _____

GPO 835-723

SEED PHYTOTOXICITY RECORD

Denver Wildlife Research Center

CHEMICAL Tetramine BIOASSAY REFERENCE Stan. 70 DATE PREPARED 8/9/63

SEED Wheat DATE PLANTED 8/9/63 CHEMICAL CONCENTRATION 1% wt.

SEED CONDITION AT TIME OF TREATMENT: Unstratified _____; Stratified _____.

FORMULATION:

- [x] CHEMICAL DISSOLVED IN ACETONE AND APPLIED TO SEED.
- [ ] CHEMICAL SUSPENDED IN ADHESIVE AND APPLIED TO SEED.
- [ ] OTHER _____

GERMINATION RESULTS

DATE	8/15	8/19	8/21				PLANTED/GERMINATED
CONTROL	91	93	94				100/94
TREATED	86	88	89				100/89

GROWTH RATE AND FORM

Slight	Pronounced	
[ ]	[ ]	ABNORMAL FOLIAR DEVELOPMENT.
[ ]	[ ]	ABNORMAL ROOT DEVELOPMENT.
[ ]	[ ]	ABNORMAL FOLIAR COLORATION.
[x]		SEEDLING APPEARED NORMAL.

Comments: _____

Investigator _____

GPO 836-707

GPO 836-707