of the American Society of Ichthyologists and Herpetologists on June 22, 1950, at Salt Lake City voted unanimously to follow the Stenzel system of endings as proposed.

Since there was a very definite opinion not to alter endings for orders and suborders in certain fields, but opinion was very strong for fixing uniform endings for superfamily on down through the subtribe, it was recommended by the committee that a new ballot be sent out on a new survey somewhat as follows:

A proposed form of ballot that might be used is herewith presented for comments:

Terminations for superorder, order, and suborder.

(Vote for only one of choices *a*, *b*, or *c*)

a) I favor adoption of terminations *-iformes* (order) and *-oidei* (suborder) ☐

b) I favor adoption of *-ica* (superorder), *-ida* (order), and *-ina* (suborder) ☐

c) I prefer to continue use of terminations for order and suborder, which are established in my field, and consequently favor rejection of any scheme of uniform terminations for superorder, order, and suborder, applicable to all animals ☐

d) I reject *a*, *b*, and *c*, but suggest the following terminations or offer the following comments:

Terminations for superfamily.

(Vote for only one of choices *e*, *f*, *g*, and *h*)

e) I favor adoption of *-oidea* (superfamily) ☐

f) I favor adoption of *-icae* (superfamily) ☐

g) I favor rejection of any scheme of uniform termination for superfamily ☐

h) I favor rejection of both *-oidea* and *-icae*, but suggest the following termination for superfamily or offer the following comments:

Terminations for supertribe, tribe, and subtribe.

(Vote for only one of choices *i*, *j*, *k*, and *l*)

i) I favor adoption of *-idi* (supertribe), *-ini* (tribe) and *-ini* (subtribe) ☐

j) I favor adoption of *-ici* (supertribe), *-idi* (tribe) and *-ini* (subtribe) ☐

k) I favor rejection of any scheme of uniform terminations for supertribe, tribe, and subtribe ☐

l) I reject *i*, *j*, and *k*, but suggest following terminations or offer following comments:

Before further plans are formulated for an extensive international survey in regard to fixation of endings of various categories of classification, the author welcomes comments. Should sufficient interest develop in this matter among systematic zoologists and applied or economic zoologists, an attempt will be made to survey the field.

Finally, the author expresses his thanks to all of those who aided in the preliminary survey, especially for the numerous constructive comments.

The Fungicidal and Nematicidal Properties of Dibromobutene

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The importance of the C_3 and C_4 unsaturated halides as soil fumigants has been amply illustrated by reports in the literature of the nematicidal properties of dichloropropene-dichloropropane mixture (*1*) and dichlorobutene (*2*), and the fungicidal as well as nematicidal effects of allyl bromide (*3*) and chlorobromopropene (*4*). All these materials are liquids possessing relatively high vapor pressures. Consequently their use is confined to application by subsurface injection, since it is difficult to obtain a biocidal concentration of vapor by surface application. When injected, they are generally effective only below the surface 2-in. zone if but one injection is made. It is possible to disinfest the surface zone only by turning the surface soil under after one injection and applying a second.

Since a double injection procedure, although effective, is time-consuming and increases the expense of fumigation, a search was made for volatile materials that could be applied directly to soil surfaces and that were capable of destroying fungi and nematodes in the upper 2-in. zone. Such a material should have a relatively low vapor pressure (when compared with the liquid fumigants) and for ease in distribution should preferably, although not necessarily, be a solid. Since organisms such as *Rhizoctonia solani*, *Phytophthora* spp., *Pythium* spp., and to some extent *Sclerotinia* spp. and *Sclerotium rolfsii*, characteristically attack in the upper 2-in. zone, the need for a soil surface disinfestant is apparent.

It is the purpose of this paper to report the finding of a material that appears to have considerable promise as a surface-zone fungicidal and nematicidal fumigant. This chemical is *trans*-1,4-dibromobutene-2. It is a white crystalline solid (bp, approximately 205° C; mp, 54° C).

For early experimental tests dibromobutene was formulated either as a dust at 10%w and 20%w in talc for tests in soil, or used directly in laboratory trials by dissolving the chemical in isooctane, acetone, or similar diluents. In preliminary screening trials, in closed glass containers, the fumigant was lethal to conidia and mycelium of *Fusarium solani pisi* and *Verticillium albo-atrum* at .002 g/l of space following an exposure of 24 hr at 21° C.

Because of the number of tests conducted in soil, and their varied nature, a summary is presented in which the fungicidal and nematicidal dosage levels are indicated (Table 1). No soil seals of any type were employed in these tests. In trials using crocks, soil was mixed with the formulated chemical in a rotating drum. For field or greenhouse soil-surface treatments,

TABLE 1

SUMMARY OF FUNGICIDAL AND NEMATICIDAL DOSAGE LEVEL RANGES FOR *trans*-1,4-DIBROMOBUTENE-2* IN FRESNO SANDY LOAM SOIL (MOISTURE EQUIVALENT 8.0–10.0%)

Pathogen	Control criterion	Dosage level ranges of dibromobutene within which complete or nearly complete fungicidal or nematicidal control effects were obtained				
		Gallon crocks	Greenhouse benches and ground beds		Field plots	
		Complete soil mix (g/gal of soil)	Surface treatment (g/sq ft)	Complete soil mix (g/cu ft)	Surface treatment (lbs/ac)	Mixed to 6-in. depth (lbs/ac)
Meloidogyne sp.	Root knot on tomatoes	.05–0.2†	> 2.0‡	1.0–2.0†	> 200	> 200
Heterodera schactii	Infestation of sugar-beet roots	0.2 –0.4†	—	2.0–3.0	—	—
Sclerotium rolfsii	Viability of sclerotia	.07–0.2†	1.0–2.0†	2.0–4.0†	100–200†	150–200†
Pythium ultimum	Damping-off of seedlings	—	0.5–2.0†	0.5–2.0†	50–100	50–100
Rhizoctonia solani	Basal stem rot of beans	—	0.5–1.0†	—	—	—
Fusarium-Pythium complex	Seedling rot and blight of peas	—	—	0.5–3.0	—	—

* Applied as a 10–20% w dust in talc. Dosage levels are given in g or lbs of active ingredient.
† Complete control or complete fungicidal and nematicidal effect in range.
‡ > indicates inadequate to no control at highest dosage used.

the chemical was spread with a garden rake, and for deeper applications in the field an Ariens-Tiller was employed.

In some instances fungicidal effects were determined by plating out exposed fungal spores and mycelium, but in the majority of cases control effects were measured by freedom of disease shown by host test plants. Table 1, therefore, summarizes briefly the results of numerous trials to determine the effectiveness of *trans*-1,4-dibromobutene-2 as a soil fumigant.

In tests on *Heterodera schactii, Meloidogyne* sp., *Pythium ultimum, Rhizoctonia solani,* and *Fusarium-Pythium* complex, naturally infested field soil was employed. Only in the case of *Sclerotium rolfsii* was the test organism introduced into the soil to be fumigated.

Failure to control the root knot nematode in field tests is felt to be due to inadequate means of mixing the dust to an effective depth in the soil. This appears to be essential, since the diffusion pattern of *trans*-1,4-dibromobutene-2 in the soil is indicated to be small (2–3 in. radius).

In addition to good disease-control effects when mixed in the soil as a formulated dust in the absence of a seal, it was noted that at fungicidal levels the chemical was not particularly toxic to crop seeds provided water was withheld for 24 hr following treatment and planting. In the case of peas and sugar beets this tolerance was outstanding. Excellent stands were obtained at control dosage levels (*Rhizoctonia* and *Pythium*) when seeds were planted at the same time the chemical was applied.

Results to date indicate, therefore, that *trans*-1,4-dibromobutene-2 may be useful as a solid fungicidal and nematicidal soil fumigant. Since mammalian toxicity tests with *trans*-1,4-dibromobutene-2 have not been completed, final appraisal of the toxicity of the compound cannot be made. However, present data indicate that the material possesses a high degree of mammalian toxicity by inhalation, ingestion, or skin contact. Fortunately, the material is a lachrymator and therefore produces definite warning symptoms.

References

1. CARTER, W. *Science,* **97**, 383 (1943).
2. LEAR, B. *Phytopathology,* **40**, 17 (1950).
3. CHRISTIE, J. R. *Proc. Helminthol. Soc. Wash., D. C.,* **14**, 23 (1947).
4. KREUTZER, W. A., and MONTAGNE, J. TH. W. *Phytopathology,* **40**, 16 (1950).

The Equilibrium between Vitamin B_{12} (Cyanocobalamin) and Cyanide Ion

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Beaven (*1*) has reported recently the reversible formation of a purple complex of vitamin B_{12} (cyanocobalamin) with cyanide ion. We also have observed this reaction, and have studied the equilibrium polarographically. Cyanide ion gives a very well-defined diffusion current at the dropping mercury anode in alkaline solutions (*2*) and thus provides an elegant means for measuring the binding of cyanide by vitamin B_{12}. No free cyanide ion could be detected in solutions of pure cyanocobalamin, and additions of cyanide resulted in further binding to form complexes containing 1 or 2 moles of cyanide in addition to the cyano-group already present in cyanocobalamin.

The procedure was as follows. A standard 0.1 *M* solution of sodium cyanide in 0.1 *M* lithium borate