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NAPHTHALENEACETIC ACID

Task 2: Topical Discussions

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Final Report

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NAPHTHALENEACETIC ACID

TASK 2

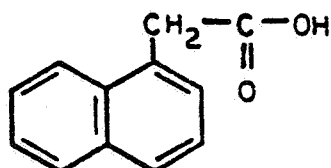
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NAPHTHALENEACETIC ACID

TASK 2

Naphthaleneacetic acid, NAA 800,
Fruitone N, Rootone, Transplantone,
Tre-Hold



1-Naphthaleneacetic acid

Data requirements are cited from EPA's Proposed Guidelines for Registering Pesticides (July 1978).

(1) PHYSICO-CHEMICAL TRANSFORMATION 163.62-7

(A) Hydrolysis 163.62-7(b)

Hydrolysis data are required to support the registration of each manufacturing-use product and of each formulated end-use product intended for terrestrial, forestry, aquatic, and aquatic impact use patterns, including products directly discharged into the aquatic environment, indirectly discharged into wastewater treatment systems, or used as treatments in a wastewater system.

No data are available on the hydrolysis of naphthaleneacetic acid (NAA).

Data Gaps

All data specified in Section 163.62-7(b) are needed to assess the hydrolysis properties of each manufacturing-use product and each formulated end-use product of naphthaleneacetamide, NAA, NAA-ammonium salt, NAA-ethyl ester, NAA-potassium salt, and NAA-sodium salt.

(B) Photolysis 163.62-7(c)

A photodegradation study in water is required to support the registration of each formulated end-use product intended for terrestrial (except greenhouse and domestic outdoor), aquatic, and forestry use, and for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

Photodegradation studies on soil surfaces are required to support the registration of each formulated end-use product intended for crop uses and forestry uses. Such studies are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product. However, uses involving injection of the product into the soil or incorporation of the product into the soil upon application are not subject to the requirements of this section.

Laboratory photodegradation studies in the vapor phase are required to support the registration of each formulated end-use product intended for greenhouse use. Such studies are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product. Exempt from these requirements are pesticides which do not contain active ingredients with vapor pressures greater than 1×10^{-7} torr at 25 C (or the equivalent expressed in other conventional units).

No data are available on the photodegradation of NAA.

Data Gaps

All data specified in Section 163.62-7(c) are needed to determine the effect of light on NAA.

(2) METABOLISM 163.62-8

Data on metabolism are required to determine the nature and availability of pesticide residues to rotational crops and to help in the assessment of potential disposal and reentry hazards.

(A) Soil 163.62-8(b,c)

An aerobic laboratory soil metabolism study is required to support registration of each formulated end-use product intended for terrestrial or forestry use. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

An anaerobic soil metabolism study is required to support the registration of each formulated end-use product intended for field or vegetable crop use. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product. However, an anaerobic soil metabolism study shall not be required if an anaerobic aquatic metabolism study has been conducted in accordance with the requirements of Section 163.62-8(d).

No data are available on the soil metabolism of NAA.

Data Gaps

All data specified in Sections 163.62-8(b,c) are needed to determine the soil metabolism of NAA.

(B) Aquatic 163.62-8(d,e)

An aerobic aquatic metabolism study is required to support the registration of each formulated end-use product intended for aquatic use or for any aquatic impact use which results in direct

discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

An anaerobic aquatic metabolism study is required to support the registration of each formulated end-use product intended for aquatic or forestry use, or for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product. The anaerobic soil metabolism study in Section 163.62-8(c) may not be substituted for this study.

No data are available on the aquatic metabolism of NAA.

No data are required on the aquatic metabolism of NAA because the use pattern indicates that introduction of NAA into the aquatic environment would not occur.

(C) Microbiological 163.62-8(f)

Data on the effects of microbes on pesticide degradation and the effects of pesticides on microbes are required to support the registration of each formulated end-use product intended for terrestrial (except greenhouse and domestic outdoor), aquatic, and forestry use, and for any aquatic impact use which results in direct discharges into the aquatic environment. These data are also required to support the registration of each manufacturing-use product which legally could be used to make such a formulated product.

Microbiological-Effects of Microbes on Pesticides 163.62-8(f)(2)

One study was reviewed and is discussed below.

No quantitative data dealing with the microbial metabolism of NAA are available. Clifford and Woodcock (MRID 05011538) implicated Aspergillus niger as metabolizing NAA (source and purity unspecified). The major product was 5-hydroxy NAA. Numerous unidentified compounds may also be degradation products, two of which were tentatively the 4- and 6-hydroxy NAA isomers. Hydroxylation of the ring structure thus appears to be a major degradation step, especially since a number of the unidentified compounds were phenolic or naphtholic in nature.

Data Gaps

All data specified in Section 163.62-8(f)(2) are needed to determine the effect of microorganisms on NAA.

Reference

Clifford, D.R., and D. Woodcock. 1968. Fungal detoxication. IX. Metabolism of 1-naphthaleneacetic acid by Aspergillus niger Van Tiegh. *Phytochemistry* 7(9):1499-1502. (MRID 05011538).

Microbiological-Effects of Pesticides on Microbes 163.62-8(f)(3)

Five studies were reviewed, were found to be valid, and are discussed below.

Little quantitative data are available pertaining to the effects of NAA on bacteria. Loveless et al. (MRID 05005277) determined that growth of Escherichia coli was inhibited approximately 50% by NAA (source and purity unspecified) at 300 ppm but that cell division was not affected. Ukita et al. (MRID 05010797) found that Staphylococcus aureus was inhibited by NAA (source and purity unspecified) at 50 ppm but that avian type tubercle bacilli were not (qualitative results). Human type tubercle bacilli (dry weight) were inhibited 60 and 90% by NAA at 63 and 125 ppm, respectively. Growth was completely inhibited by NAA at 250 ppm and above.

The effects of NAA on two common soil fungi, one a yeast and the other mycelial, were studied. Much of this work dealt with mutants, thereby introducing a large degree of uncertainty if an attempt is made to extrapolate this information to the natural environment. Loveless et al. (MRID 05005277) found that NAA (source and purity unspecified) at 500 ppm inhibited growth of Saccharomyces cerevisiae by 58% and also inhibited cell division (treated cells were 190% the size of control cells). A later study by Doi et al. (MRID 05008826) showed a similar degree of inhibition; NAA (source and purity unspecified) at 100-500 ppm inhibited growth of S. cerevisiae by 13-55%. NAA at 500 ppm was also found to induce stable polyploid mutants with a resultant increase in nucleic acid and protein content. Another result of polyploidy was an increase in cell size, suggesting that the similar observation made by Loveless et al. (MRID 05005277) is due not to an inhibition of cell division but rather to polyploidy. The large mutants exhibited a growth response to NAA similar to that of the parent strain, although asci production was 57-114% higher in mutant hybrids than in the parent hybrids. Klein (MRID 05010966) found that growth (dry weight) of a lysineless mutant of Neurospora crassa was inhibited 28-68% by NAA (source and purity unspecified) at 10-50 ppm. A p-aminobenzoic acidless mutant was inhibited 12-25% by NAA at 30-50 ppm. Linear growth of both mutants was inhibited by less than 25%, compared with untreated controls, at NAA concentrations up to 50 ppm. A wild type N. crassa strain was not tested.

The effects of NAA on one unicellular green alga, Chlorella pyrenoidosa, were studied by Gramlich and Frans (MRID 05009027). Growth (turbidimetric) of this common soil alga was inhibited approximately 40 and 80% by NAA (source and purity unspecified) at 46 and 372 ppm, respectively.

In summary, NAA has been shown to inhibit bacteria, fungi, and an alga. It also appears capable of inducing polyploid mutants. These effects occurred in the NAA concentration range of 10-500 ppm, which, based on the use pattern, is much higher than would be expected to occur in soil in the field (0.01-0.08 ppm). The effect of NAA at normal field application rates on soil microorganisms is not known.

Data Gaps

All data specified in Section 163.62-8(f)(3) are needed to determine the effect of NAA on microorganisms.

References

Doi, S., T. Takahashi, and N. Yanagishima. 1973. Auxin-induced large cell mutants in Saccharomyces cerevisiae. I. Induction, and biochemical and genetic characters. Jap. J. Genetics. A translation of: Idengaku Zasshi. 48(3):185-195. (MRID 05008826)

Gramlich, J.V., and R.E. Frans. 1964. Kinetics of Chlorella inhibition by herbicides. Weeds 12(3):184-189. (MRID 05009027)

Klein, D.T. 1962. Effect of growth regulators on mutants of Neurospora crassa. Physiologia Plantarum 15:239-245. (MRID 05010966)

Loveless, L.E., E. Spoerl, and T.H. Weisman. 1954. A survey of effects of chemicals on division and growth of yeast and Escherichia coli. J. Bacteriol. 68:637-644. (MRID 05005277)

Ukita, T., O. Tamemasa, and H. Motomatsu. 1951. Antibacterial action of fatty acids. VIII. Syntheses of fatty acids with naphthyl, naphthomethyl and benzyl groups in alpha-position and their antibacterial action. Yakugaku Zasshi. J. Pharm. Soc. Jap. 71(4):289-297. (MRID 05010797)

(D) Activated Sludge 163.62-8(g)

A laboratory study of the effects of pesticides on the wastewater treatment process is required to support the registration of all manufacturing-use chemicals and all formulated products that are indirectly discharged into wastewater systems.

No data are available on the activated sludge metabolism of NAA.

Data Gaps

All data specified in Section 163.62-8(g) are needed to assess the effects of each manufacturing-use product and formulated product of naphthaleneacetamide, NAA, NAA-ammonium salt, NAA-ethyl ester, NAA-potassium salt, and NAA-sodium salt on wastewater treatment facilities.

(3) MOBILITY 163.62-9

Data on mobility are required to determine pesticide residue movement in the environment.

(A) Leaching 163.62-9(b)

Leaching data are required to support the registration of each formulated end-use product intended for terrestrial noncrop, tree fruit/nut crop, aquatic, or forestry use or for any aquatic impact use resulting in direct discharges into the aquatic environment. Such data are also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data are available on the leaching potential of NAA.

Data Gaps

All data specified in Section 163.62-9(b) are needed to determine the leaching potential of NAA.

(B) Volatility 163.62-9(c)

Volatility studies are required to support the registration of each formulated end-use product intended for greenhouse use. Volatility studies will also be required to support the registration of each formulated end-use product intended for use in open agricultural sites such as fields and groves where reentry must be considered. Such studies are also required to support the registration of each manufacturing-use product which legally could be used to make any end-use product for which volatility studies are required.

Exempt from these requirements are pesticides which do not contain an active ingredient with a vapor pressure greater than 1×10^{-7} torr at 25 C (or equivalent expressed in other conventional units). For those pesticides that contain an active ingredient with vapor pressures greater than 1×10^{-7} torr at 25 C, laboratory studies will be conducted for verification of potential volatilization hazards. Greenhouse and/or field studies will then be required for those pesticides that demonstrate a high potential for volatilization. Alternatively, applicants may omit the laboratory studies and proceed directly to a greenhouse and/or field study.

No data on the volatility of NAA are available.

Data Gaps

All data specified in Section 163.62-9(c) are needed to determine the volatility of the acid form of NAA.

(C) Adsorption/Desorption 163.62-9(d)

A laboratory study using radioisotopic or nonradioisotopic analytical techniques is required to support the registration of all formulated products intended for terrestrial, forestry, and aquatic uses, and for any aquatic impact use which results in direct discharges into the aquatic environment. These data are also required to support the registration of each manufacturing-use product which legally could be used to make such a formulated product.

No data are available on the adsorption/desorption of NAA.

Data Gaps

All data specified in Section 163.62-9(d) are needed to evaluate the adsorption/desorption of NAA.

(D) Water Dispersal 163.62-9(e)

A field study tailored to one or more representative sites is required to support the registration of all formulated products intended for aquatic uses and for any aquatic impact use which results in direct discharges into the aquatic environment. These data are also required to support the registration of each manufacturing-use product which legally could be used to make such a formulated product.

No data are available on the water dispersal of NAA.

No data are required on the water dispersal of NAA because the use pattern indicates that introduction of NAA into the aquatic environment would not occur.

(4) FIELD DISSIPATION 163.62-10

A field dissipation study under actual use conditions is required to support the registration of all manufacturing-use and formulated products intended for terrestrial (except greenhouse) uses, aquatic uses, and forestry uses.

(A) Terrestrial 163.62-10(b)

A terrestrial field dissipation study is required to support the registration of each formulated end-use product intended for terrestrial (except greenhouse) use. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data are available on the terrestrial field dissipation of NAA.

Data Gaps

The following data are needed to determine the dissipation rate of NAA in a terrestrial environment:

- All data specified in Section 163.62-10(b)(2) for the following formulations:

Naphthaleneacetamide
8.4% ai wettable powder
0.176 lb/gal soluble concentrate/liquid

NAA
0.2% ai dust
3.5% ai wettable powder
0.106 lb/gal emulsifiable concentrate
0.28 lb/gal soluble concentrate/liquid

NAA-ammonium salt
1.76 lb/gal soluble concentrate/liquid

NAA-sodium salt
7.11% ai wettable powder
98% ai crystalline
3.5% ai soluble concentrate/solid

- All data specified in Section 163.62-10(b)(4) for the following NAA formulations:

NAA
0.12% ai soluble concentrate/liquid

NAA-ammonium salt
1.76 lb/gal soluble concentrate/liquid

NAA-ethyl ester
1% ai ready to use
1% ai pressurized liquid

NAA-sodium salt
7.11% ai wettable powder

(B) Aquatic 163.62-10(c)

An aquatic field dissipation study is required to support the registration of each formulated end-use product intended for aquatic uses (food crop and noncrop), including products intended for application to ditchbanks and shorelines and for unintentional direct aquatic applications, or for any aquatic impact use which results in direct discharges into the aquatic environment. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data are available on the aquatic dissipation of NAA.

No data are required on the aquatic dissipation of NAA because the use pattern indicates that introduction of NAA into the aquatic environment would not occur.

(C) Forestry 163.62-10(d)

A forestry study is required to support the registration of each formulated end-use product intended for forest use and of each manufacturing-use product which legally could be used to make such an end-use product.

No data are available on the dissipation of NAA in a forest.

No data are required on dissipation of NAA in a forest because the use pattern indicates that introduction of NAA into a forest would not occur.

(D) Aquatic Impact Uses 163.62-10(e)

Aquatic impact use studies are required to support the registration of all formulated products that will be directly or indirectly discharged into the aquatic environment or end-use products intended for use in wastewater treatment systems, cooling water towers, or pulp and paper mill water treatment. These data are also required to support the registration of each manufacturing-use product which legally could be used to make such a formulated product.

No data are available on the aquatic impact of end-use NAA.

No aquatic impact data are required for end-use NAA because the use pattern indicates that it would not be directly or indirectly discharged into the aquatic environment.

(E) Combinations and Tank Mixes 163.62-10(f)

A laboratory or field soil dissipation study, using the formulated product or the nonradiolabeled technical grade of each active ingredient, is required to support the registration of all formulated products intended for combinations and/or tank mixtures. This study shall compare the dissipation characteristics of active ingredient of the mixture when applied to the soil as a mixture with the separate dissipation characteristics of each active ingredient in soil when applied individually.

No data on the dissipation of multiple active ingredient formulations of NAA are available.

Data requirements for combinations and tank mixes containing NAA are not cited here because this standard deals only with a single active ingredient.

(5) ACCUMULATION 163.62-11

Data on accumulation are required to determine accumulation in food webs.

(A) Rotational Crops 163.62-11(b)

Accumulation studies on rotational crops are required to support the registration of each formulated end-use product intended for field/vegetable or aquatic food or feed crop use and for use on any site on which it is reasonably foreseeable that any food or feed crop may be produced after application of a pesticide. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data are available on the accumulation of NAA in rotational crops.

No data are required on the accumulation of NAA in rotational crops because the use pattern indicates that NAA is not used on field/vegetable or aquatic food crops.

(B) Irrigated Crops 163.62-11(c)

A crop residue study under actual field use conditions is required to support the registration of each formulated end-use product intended for aquatic food crop or aquatic noncrop uses, for uses in and around holding ponds, or for uses that involve effluents and other discharges which in turn are used to irrigate crops. Such a study is also required to support the registration of each manufacturing-use product which legally could be used to make such an end-use product.

No data on the uptake of NAA in irrigated crops are available.

No data are required on the accumulation of NAA in irrigated crops because the use pattern indicated that crops are not irrigated with NAA-treated water.

(C) Fish 163.62-11(d)

- (1) A fish accumulation study is required to support the registration of each formulated end-use product intended for outdoor use (except domestic outdoor), or aquatic impact uses resulting in direct discharge into aquatic environments, and for each manufacturing-use product that could be legally used to produce such a product, except when the criteria below are satisfied.
- (2) Fish accumulation data will normally not be required in situations where the registrant can offer evidence acceptable to the Agency showing that the applied pesticide and/or its principal degradation product(s):
 - (i) Will not reach water, or will not persist in water (i.e., a nominal half-life of four days or less); and
 - (ii) Has physical properties suggesting a relatively low potential for accumulation (i.e., a nominal octanol/water partition coefficient less than 1000); or
 - (iii) Does not accumulate in the organs and tissues of mammals or avian species.
- (3) The Agency may consider the particular use pattern and the rate and frequency of application in making a decision to waive or maintain the data requirement (such as in cases where movement to water is obviously negligible or where frequent application counteracts a fast dissipation rate).

No data are available on the accumulation of NAA in fish.

Data Gaps

All data specified in Section 163.62-11(d) are needed to determine if NAA will accumulate in fish.