127201

FILE

Date Out EFB: 22 JUN 1983

TO: Hank Jacoby
Product Manager 21
TS-767

FROM: Dr. Richard Moraski
Acting Chief
Review Section No. 1
Exposure Assessment Branch
Hazard Evaluation Division

Attached please find the environmental fate review of:

Reg./File No.: 3125-GUA, 3125-GUT

Chemical: Baytan

Type Product: Fungicide

Product Name: Baytan 150 FS

Company Name: Mobay Chemcial Corp.

Submission Purpose: Review all data requirements for use as a seed treatment.

ZBB Code: Other

ACTION CODE: 100, 115

Date in: 3/29/83

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Date Completed: 6/22/83

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61	5

Deferrals To:

_______ Ecological Effects Branch

_______ Residue Chemistry Branch

_______ Toxicology Branch

1.0 INTRODUCTION

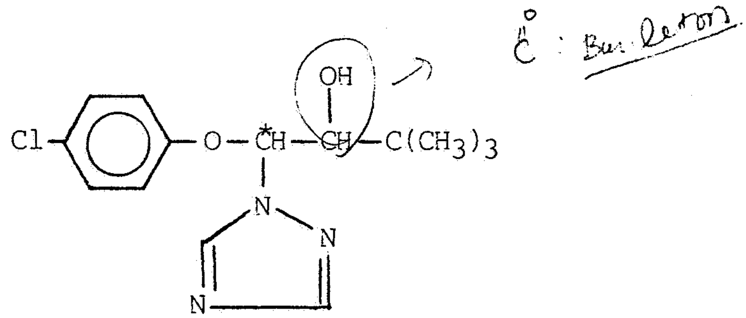
Mobay Chemical Corporation has submitted applications for registration of Baytan Technical for manufacturing use only and for Baytan 150 FS as a seed treatment for control of certain (fungal) diseases on small grains and corn.

1.1 Chemical

Common name: Baytan

Chemical name: 1-(4-chlorophenoxy)-3,3-dimethyl-1-(H-1,2,4-triazol-1-yl)-2-butanol

Chemical structure:



*-Asymmetric carbon. Baytan exists in two enantiomeric pairs (D and L) of diastereoisomers, "Forms I and II."

Note: Baytan is the reduction/degradation product of Bayleton.

2.0 DIRECTIONS FOR USE

Use directions are appended to this review.

3.0 DISCUSSION OF DATA

3.1 The Behavior of Baytan in Sterile Aqueous Solutions. S. S. Nichols and J. S. Thorton. May 1, 1980. Mobay Chemical Co. Report No. 68673. EPA Acc. no. 071462.

Procedure

Autoclaved, sterile buffer solutions were fortified with 5 or 50 ppm phenyl-ring-UL-^{14}C Baytan and maintained at 20 $\pm$ 1° (ambient lab. temperature) or 40 $\pm$ 1°C in constant temperature water bath. All samples were kept in dark.

Buffer solutions were: pH 4.5, potassium phosphate; pH 7.1, potassium sodium phosphate; pH 9.2, potassium sodium borate

Aliquots of solutions were taken after 0, 7, 15, and 32 days incubation. Subsamples were spotted directly onto TLC plates and developed. TLC spots were tenatively identified by co-chromatography with non-labeled reference compounds. ^{14}C was located on TLC plates by autoradiography and quantitated by LSC of TLC scrapings.

Results

The authors report that Baytan in sterile aqueous buffer solutions showed no apparent degradation at either temperature or pH tested. Recovery was 97% or greater after 32 days incubation.

Conclusions

EAB accepts the conclusion that Baytan is stable to hydrolysis.

3.2 Photodegradation of Baytan in Aqueous Solutions and on a Soil Surface. J. J. Obrist and J. S. Thronton. October 22, 1978. Mobay Chemical Corp. Report No. 66794. EPA Acc. no. 071462.

Procedure

Aqueous: Distilled aqueous solutions fortified with 5 ppm ring-UL-^{14}C Baytan (Form II)* were irradiated with FS-20 sun lamps and F20T12-BL black lamps as artifical light source (Intensity measured at 1,000 - 1,200 microwatts/cm^2 at 3 inches). Solutions were maintained in an environmentally controlled growth chamber at constant temperature of 25° C and humidity of 55%. Also, identical solutions with 2% acetone/water were prepared to study effects of photosensitizer. Solutions were covered with quartz plates and irradiated. Air was pulled over solutions via vacuum system and volatiles were trapped in ethylene glycol (neutral organics), 10% sulfuric acid (basic volatiles and polar organics) and 10% sodium hydroxide (acidic volatiles). A set of control samples were kept in the dark.

At various times the solutions were sampled. Total ^{14}C was determined directly before and after extraction by LSC of subsamples. ^{14}C in samples was determined by TLC of unextracted aqueous sample or of extracted ^{14}C obtained by partitioning aqueous solution with water-saturated chloroform/acetonitrile (2:1) and then separation by TLC. ^{14}C metablites were located by radiochromatographic scanning or autoradiography. $^{14}CO_2$ was confirmed by barium carbonate precipitation of the NaOH trap. Quantitation of ^{14}C on TLC plates was by LSC of scraped TLC spots.

Soil: A silty clay loam soil (0% sand, 66% silt, 34% clay, 2.4% organic matter, pH 5.9, CEC= 32 meq @ pH 5.2) was sieved to 2.0 mm and air-dried. A soil-water slurry was made and added to Perti dishes then allowed to dry. Soil thickness was approximately 1.0 mm (ca. 3 gm soil). Soil was fortified with ring-UL-^{14}C Baytan (Form

*Form II had been the predominant isomer found in soil and water degradation studies of Bayleton.

II) to 2 ppm (approximating normal application rate of 0.385 oz AI/acre or 0.5 oz. AI/100 lbs seed). The Petri dishes were placed in growth chambers. The irradiation scheme was identical to that described above. Volatiles were also trapped, as above.

A set of control soil samples were maintained under identical conditions but with no irradiation.

At various times, dishes were removed from the chambers and soil extracted with methanol. Analysis of extracted residues was by TLC. Extracted soil was combusted for $^{14}CO_2$ (unextracted residues).

Results

The authors report that ring-UL-^{14}C Baytan (form II) in distilled water had a photolytic half-life of approximately 36 hours and 17 hours in the 2% acetone solution.

$^{14}CO_2$ was formed in both solutions: 8% of the radioactivity volatilized after 142 hours irradiation of the nonsensitized solution and 39% of the radioactivity in the sensitized solution volatilized after 96 hour irradiation.

Other degradation products were not identified. It was postulated that these degradation products (the ^{14}C material remaining at the origin of the TLC plates) consisted of polar, high molecular weight polymers. Of the 73% that degraded in the non-sensitized solution, 65% had a molecular weight >700 (based on gel permeation molecular exclusion column). The same type polymers were found in the sensitized solution and accounted for 36% of the applied ^{14}C after 96 hours irradiation.

The authors also report that little degradation occurred when applied to the soil surface and irradiated. After 7 days irradiation, 85% of the applied ^{14}C was recovered as unchanged parent Baytan.

There was loss of ^{14}C during the study (in both irradiated and control soil but this loss could not be clearly explained since no ^{14}C-volatile compounds were found. After 30 days irradiation, 77% of the ^{14}C applied was recovered as unchanged Baytan and in the dark control, 83% was recovered as unchanged Baytan.

No degradation products were observed in the dark aqueous control sample.

Conclusion

The data suggest Baytan photodegrades with half-lives of 36 hours in distilled water and of 17 hours in a photo-sensitized (acetone) solution. Baytan appears to be stable to photolysis on the soil surface.

However, the study in incomplete. The registrant should submit data that show the artifical light source produced light similar to natural sunlight. A literature reference was cited, but no data or a copy of this reference were given.

Note: The authors state that the 2 ppm soil application rate approximated normal field rate. This contradicts the argument presented in 3.13, below, which calculates that normal application rate would be 0.014 ppm for the 0-6 inch soil horizon. EAB considers the 0.014 ppm more accurate. Also, the pH of the aqueous solution was not reported. However, Baytan is stable to hydrolysis over the pH range of 4- 7.

3.3 The Aerobic and Anaerobic Soil Metabolism of BAYLETON. R. R. Mango and R. J. Puhl. January 12, 1977. Mobay Chemical Corp. Report No. 51230. EPA Acc. No. 071462

This study was reviewed by EFB 6/26/78 in support of registration of BAYLETON. Since Baytan is the major degradate of Bayleton, the study is considered in supporting the registration of Baytan for the proposed use.

Procedure

A silty clay loam soil (0% sand, 66% silt, 34% clay, 2.4% organic matter, pH = 5.9) was fortified with Bayleton-triazol-3,5-^{14}C at 1 and 10 ppm. Humidified air was constantly passed over soil and volatiles were trapped in mineral oil (non-polar organics), sulfuric acid (basic and polar organics) and NaOH (acidic volatiles). Soil was sampled periodically over the 238 day incubation period. Other soil samples were fortified to 1 and 10 ppm then covered with 2-3 cm water to create anaerobic conditions and incubated.

Also, a soil sample was fortified with Bayleton-phenyl-UL-^{14}C at 1 ppm and analyzed at the end of the 238 day incubation period.

An outdoor plot of sandy loam soil (74% sand, 16% silt, 10% clay 17.1% organic matter, pH =7.4) was treated with Bayleton-triazol-3,5-^{14}C at rate of 1 lb/A incorporated to 6 inch depth (equivalent to 0.5 ppm concentration). Soil was sampled periodically over a 90 day exposure period. Also, soil from an untreated area was taken and fortified to 1 ppm and maintained under aerobic conditions in the laboratory. Soil was sampled periodically over a 28 day incubation period.

Results

The authors report that Bayleton degraded to KWG 0519 (Baytan) in soil maintained under aerobic and anaerobic conditions in the lab. Baytan did not significantly degrade further.

The aerobic soil study showed that Baytan had an estimated half-life of 8 to 9 months. Baytan reached a maxiumun level of 68% of the applied 14C in 71 days and declined slightly to 45.2% by day 238.

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Also, 1,2,4-triazole was found as a minor metabolite.

Unextracted ^{14}C material gradually increased during the incubation period (accounting for 32.6% of the applied ^{14}C by day 238).

Ring-UL-^{14}C-Bayleton evolved 24% of the applied ^{14}C as $^{14}CO_2$ after 238 days incubation, compared to 5% of the triazole-labeled-^{14}C-Bayleton volatilized as $^{14}CO_2$.

Under anaerobic conditions, Baylteon degraded to Baytan which accounted for 70.2% of the applied ^{14}C by day 70 incubation. Baytan concentration remained relatively constant through the incubation period, accounting for 72.8% of the applied ^{14}C after 238 days incubation. See Figure .

No half-life calculation was determined for the anaerobic soil metabolism study.

No tabular data for the degradation of Bayleton/dissipation of Baytan were presented for the outdoor exposure study.

Conclusion

This study satisfies the data requirement for aerobic and anaerobic soil metabolism study for Baytan.

Baytan is stable under soil conditions maintained in the laboratory. Aerobic soil half-life is estimated to be 8-9 months. Anaerobic soil half-life would be considerably greater than 8-9 months.

3.4 Soil Adsorption and Desorption of BAYTAN-II. R. J. Puhl and J. B. Auxley. December 12, 1978. Mobay Chemical Corp Report no. 66745. EPA Acc. No. 071462.

Procedure

Baytan-phenylene-UL-^{14}C (Form II) at concentrations of 0.49, 0.96, 4.78 and 9.57 ppm were added to sieved and air-dried loam, silty clay and sand soils. (See Table I for soil characteristics.) Solutions were equilibrated for 2 hours by shaking in an incubation bath at 25° C.

After incubation, desorption rates were determined. A portion of the water in the adsorption study was removed and replaced with additional water. The solution was then equilibrated for 1 hour by shaking.

The authors state that prior studies showed that the 2 hours and 1 hour periods were adequate for equilibration of the solutions.

TABLE I

Soil Analyses

Textural Analysis (%)	Kansas Soil	Hagerstown, MD Soil	Florida Soil
Sand	46	4	92
Silt	36	53	7
Clay	18	43	1
Class	Loam	Silty Clay	Sand
Organic Matter (%)[a]	3.0	2.1	3.7
pH[b]	5.5	6.7	6.9
Cation Exchange Capacity[c] (meq/100 gm at pH [illegible])	27.6	28.6	26.6
Particle Density (gm/cc)	2.8	2.49	2.49

[a] Total organic carbon x [illegible]

[b] pH in 0.01 M $CaCl_2$

[c] CEC using sodium acetate, pH [illegible]

After equilibration, the solutions were centrifuged and the ^{14}C in the supernatant was determined by LSC. Aliquots of water were extracted wih organic solvents. Extracted residues were analyzed by TLC.

Adsorption coefficients, K, were determined using the Fruendlich equation.

Results

The authors report that the adsorption coefficients, K, for Baytan ranged from 2.37 to 5.26.

The K values for desorption ranged from 1.49 in a silty clay soil (0.49 ppm conc.) to 9.12 in a loam soil (9.57 ppm conc.). ~~See Table~~.

The authors report that there was not obvious correlation between adsorption and soil organic matter content. The highest degree of adsorption was observed with the loam soil, intermediate in organic matter content.

Conclusion

Based on low adsorption coefficients, Baytan will have a low to moderate potential to bind to soil particles.

3.5 Soil Thin-Layer Mobility of BAYCOR, BAYTAN, DYRENE AND PEROPAL. J. J. Obrist and J. S. Thornton. October 22, 1979. Mobay Chemical Corp. Report No. 68272. EPA Acc. no. 071462.

Six natural soils were air-dried and sieved through a 250 or 420 um sieve (See Table II for soil characteristics). Water was added to soils to form slurry and applied to TLC plates to either 0.75 mm thichness (for fine textured soils) or 2.5 mm (for sandy soils). Plates were air-dried before use. ^{14}C-pesticides were applied to the plates then plates developed in distilled water. The ^{14}C on the TLA plates was located by autoradiography.

Results

Baytan (Forms I and II) had average R_f values of 0.29 and 0.27, respectively. The R_f values ranged from R_f = 0.58 in the Oregon sandy loam soil to R_f = 0.16 on the Kansas silty clay soil.

Conclusion

Baytan has an average mobility class of 2, according to the Helling and Turner soil TLC classification scheme, indicating that Baytan would have a low potential to leach in soils. However, Baytan may have a moderate potential to leach in some Western Soils.

TABLE II

Textural Characteristics[1] of Soils Used in Leaching Studies

Soil Type	Origin	Sand, %	Silt, %	Clay, %	Organic Matter, %	pH
Agric. Sand[2]	Vero Beach, FL	92	1	7	0.3	5.9
Sandy Loam[2]	Merrill, OK	73	14	13	2.[illegible]	6.6
Sandy Clay Loam[2]	Howe, IN	56	21	23	0.6	5.5
Silt Loam[3]	Concord, NB	18	57	25	5.[illegible]	7.9
Silty Clay[3]	Hagerstown, MD	[illegible]	[illegible]	[illegible]	2.[illegible]	[illegible].7
Silty Clay[3]	Stanley, KS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[1]Analyzed by Agricultural [illegible]

[2]Sieved through [illegible] µm screen.

[3]Sieved through 25[illegible] µm screen.

3.6 Leaching Characteristics of Aged Baytan Soil Residues. J. J. Obrist November 15, 1979. Mobay Chemical Corp. Report No. 68421. EPA Acc. no. 071462.

Procedure

Moist Kansas sandy loam soil (58% sand, 32% silt, 10% clay, 2.8% organic matter, pH = 5.1, CEC = 15.3 meq/100 gm at pH 8.2) sieved to 2.0 mm was fortified to 10 ppm with phenyl-UL-^{14}C Baytan (Form II) and aged aerobically at room temperature for 30 days. Three soil columns, 4.8 cm i.d. and 30 cm long, were prepared consisting of 10-, 10-, 5-, and 5-cm sections. Treated aged soil was added to the column then capped with 1 cm untreated soil. 1/2 inch simulated rainfall was applied to the column each day for a period of 45 days. 23 ml of leachate was collected from each column daily.

After leaching, the column was divided into sections. Total ^{14}C in soil was determined by combustion. ^{14}C in soil sections were extracted by refluxing soil with methanol then methanol/water (7:3). Total ^{14}C extracted was determined by LSC. Residues were separated by TLC. Identification of metabolites was by co-chromatography of known standards.

Results

The authors report that 99% of the applied ^{14}C was recovered, nearly all as unchanged Baytan, Form II.

The residues remained primarily in the uppermost section of the soil column. 40.6% - 51.2% was in the 0-1.3 cm depths. Greater than 80% of the ^{14}C was found in the upper 5 cm of the soil columns. No ^{14}C was found in the bottom 7.5 cm of the soil columns. 0.5% of the applied ^{14}C was found in the leachate.

Of the ^{14}C in the upper sections, >97% was unchanged Baytan.

Conclusions

Aged residues (actually unchanged parent baytan) did not leach in soil columns and thus would have low potential to leach in the field soil.

While it is not stated, EAB assumes that quantitation of the ^{14}C residues separated by TLC was by LSC of the TLC plate scrapings.

3.7 BAYTAN Water Solubility and Octanol Water Partition Coefficient. W. M. Leimkuehler. July 3, 1980. Mobay Chemical Corp. Report No. 68869. EPA Acc. no. 071462.

This study is not required by the Subpart N of the Guidelines. Only the results will be discussed.

The authors report that the solubility of Baytan Forms I and II in water is 95 ppm and 49 ppm, respectively at 20 $\pm$ 1°C.

The octanol water partition coefficient of Baytan was determined to be 794 for form I and 1305 for form II.

3.8 A Gas Chromatographic Method for Bayleton and KWG 0519 in Soil and Water. J. S. Thornton and C. M. Lloyd. January 31, 1977. Mobay Chemical Corp. Report no. 51231. EPA Acc. no 071462.

Water samples are partitioned with chloroform and transferred to florisil column for cleanup.

Soil samples are refluxed with methanol:water then filtered. The filtrate is partitioned with chloroform, aqueous washed, re-partitioned, evaporated to dryness, redissolved an transferred to florisil column for cleanup.

Residues were eluted from the columns with solution of hexane/ethyl acetate (6:4). Analysis of the columns eluate is by gas chromatography equipped with nitrogen-specific alkali flame detector. Sample chromatograms were included.

Recovery of Bayleton and KWG 0519 (Baytan) ranged from 81%-103% at 1.0, 0.10, and 0.05 ppm fortification in soil. In water, recovery ranged from 96%-103% for Bayleton and KWG 0519.

3.9 Recovery of Bayleton and KWG 0519 From Soil. Annon. February 22, 1977. Mobay Chemical Corp. Report No. 51711. EPA Acc. No. 071462.

This study consists of (1) a reference to the analytical precedure in 3.8, above, as being the method for which Bayleton and KWG 0519 (Baytan) residues from various soils were analyzed; (2) sample chromatograms; and (3) a table of results.

Using fortification levels of 1.0, 0.1 and 0.05 ppm, Bayleton and KWG 0519 residues recoveries ranged from 73% to 101% in the various soils.

3.10 The Effect of Frozen Storage at 0° to -10°F on Bayleton and KWG 0519 Residues in Loam Soil. Mobay Chemical Corp. Report No. 52725. EPA Acc. No. 071462.

Soil fortified at 6.09 and 1.53 ppm of Bayleton and KWG 0519, respectively and stored up to 516 days showed little decomposition for the duration of the period of storage.

3.11 Residues of Baytan in Seed-Treatment Wheat. W. M. Leimkuehler and J. S. Thornton. November 5, 1982. Mobay Chemical Corp. Report no. 69209. EPA Acc. No. 071462.

Wheat seeds were treated with Baytan-ring-UL^{14}C mixture of isomers to approximate recommended field application rate of 0.5 oz. per 100 lb. seed. Treated seed were planted to a depth of 1/2 inch in a sandy loam soil at rate of 60 lbs. seed per acre.

Wheat forage was sampled at 15 and 45 days after planting; grain and straw ware collected at 65 days after planting. The top 6 inches soil was removed, mixed and sampled.

Results

The authors report that residues of Baytan, reported as ^{14}C Baytan equivalents, in forage at 15 and 45 days were 0.2 and 0.04 ppm, respectively. Residue in mature grain was 0.015 ppm and in mature straw was 0.18 ppm. Extracted residues were tenatively identified as Baytan I and II, KWG 1342 and Bayleton.

The soil contained 0.006 ppm total ^{14}C calculated as baytan equivalents.

A total of 58% of the originally applied ^{14}C was recovered. The authors suggest that the ^{14}C unacccounted for was lost as $^{14}CO_2$ from microbial activity.

Conclusion

This study is a plant metabolism study and does not qualify as a rotational crop study.

EAB notes that the suggestion that microbial activity degraded Baytan contradicts the conclusions of the soil metabolism studies reviewed in Section 3.3, above.

3.12 Residue Analysis Procedure for Bayleton and Metabolites in Barley and Wheat. J. J. Obrist, et al. September 27, 1982. Mobay Chemical Corp. Report No. 80488. EPA Acc. No. 071462.

This report concerns a more extensive extraction procedure for plant residues that also includes using enzyme hydrolysis to release conjugated plant metabolites. The method will measure the metabolites KWG 1323 and KWG 1342.

3.13 The registrant has submitted no field dissipation or rotational crop studies in this registration application. No waiver from the requirement of thiese studies were submitted. However, the registrant did present a rationale that, based on the limited application rate, it would not be practical to evaluate the field dissipation of Baytan in soil:

Rationale

The proposed treatment is 0.5 oz. active ingredient per 100 cwt seed. Wheat is planted at 1-1 1/2 bu (60-90 lbs.) per acre.

0.5 oz. AI/cwt seed = 0.031 lb. AI/cwt seed.

$$\frac{0.031 \text{ lb. AI}}{\text{cwt seed}} \times \frac{0.9 \text{ cwt seed}}{\text{Acre}} = 0.028 \text{ lb. AI/ acre.}$$

If 1 acre of soil 6 inches deep weighs approximately 2 X 10^6 lbs, then

$$\frac{0.028 \text{ lbs AI/Acre}}{2 \times 10^6 \text{ lbs. soil/Acre}} = 0.014 \text{ ppm AI in the 0-6 inch soil horizon,}$$

assuming that all the baytan will transfer from treated seed to surrounding soil.

The sensitivity of the anayltical method is based on instrument sensitivity where response for 0.1 ppm produced a peak approximately 10 cm in height. Assuming 1 cm is the smallest peak height that can be measured, the limit of sensitiviy, based on simple proportion, would be 0.01 ppm.

Even at day 0, sample values would be at the limit of sensitivity making any decline curve or half-life calculation impossible. Thus it would not be practical to evaluate the dissipation of Baytan in soil from seed treatment.

Conclusion

EAB accepts the rationale that, based on the amount of Baytan to be applied in the field, residues would be at or below the the limit of sensitivity of the analytical method. EAB, therefore waives the field dissipation and rotational crop data requirements for the proposed use of Baytan

The registrant should be informed that if future registration applications include use rates greater than that proposed here, these studies may be required.

3.13 No fish accumulation study has been submitted. No waiver from the requiremnet of a fish accumulation study was submitted.

However, based on the rationale presented above in 3.12 and the little likelihood of aquatic contamination from runoff, this data requirement is also waived.

4.0 EXECUTIVE SUMMARY

4.1 The following data requirements have been satisfied for Baytan and support the proposed use as a seed treatment on small grains and corn:

Hydrolysis
Aerobic soil metabolism
Anaerobic soil metabolism
Leaching

4.2 Additional information is needed to complete the following studies:

Photolysis
Adsorption/desorption

See Sections 5.2 and 5.3 below for specific deficiencies.

4.3 The following data requirements have been waived based on the proposed limited use pattern:

Field dissipation
Rotational crop
Fish accumulation

5.0 RECOMMENDATIONS

5.1 EAB has no objections to the registration of Baytan for the proposed use as a seed treatment on small grains and corn, provided:

5.1.1 The registrant provides additional data, or a copy of the reference cited indicating that, in the phtotolysis study, the artifical light source produced light similar to natural sunlight, and

5.1.2 Data are provided that show adsorption and desorption equilibria were reached within the one and two hour equilibration periods quoted in the studies.

5.2 The registrant should be advised that additional uses of Baytan may necessitate the submission of the waived data requirements.

Clinton Fletcher
Review Section No. 1
Exposure Assessment Branch
Hazard Evaluation Division

Baytan exposure assessment review

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