3-23-87

108401
SHAUGHNESSY NO.

REVIEW NO.

EEB BRANCH REVIEW

DATE: IN 01/28/86 OUT MAR 2 3 1987

FILE OR REG. NO. 239-2449, 239-2450

PETITION OR EXP. PERMIT NO.

DATE OF SUBMISSION 01/08/86

DATE RECEIVED BY HED 01/24/86

RD REQUESTED COMPLETION DATE 03/24/86

EEB ESTIMATED COMPLETION DATE 03/17/86

RD ACTION CODE/TYPE OF REVIEW 576

TYPE PRODUCT(S): I, D, H, F, N, R, S Herbicide

DATA ACCESSION NO(S). 260925

PRODUCT MANAGER NO. R. Mountfort (23)

PRODUCT NAME(S) Bolero 8 EC

Bolero 10G

COMPANY NAME Chevron Chemical Company

SUBMISSION PURPOSE Registrant response to previous EEB review.

SHAUGHNESSY NO.	CHEMICAL & FORMULATION	% A.I.

This includes original DER.

(1)

ECOLOGICAL EFFECTS BRANCH REVIEW

BOLERO

100 Submission Purpose

In a January 8, 1986, letter from Chevron Chemical Company to Mr. Richard Mountfort, Chevron commented on several points presented in the August 20, 1985 EEB review on the use of Bolero on rice. This response also included EEB's review of Chevron's aquatic field study near Matagorda, Texas. Chevron concludes that "There is absolutely no evidence in our Texas field study which shows thiobencarb adversely affects the aquatic community. The changes observed in the Texas study can be attributed to salinity, temperature, abbreviated sampling, and seasonal variations but not to thiobencarb."

Response to Chevron's Comments

The purpose of the study was to determine if Bolero could be used on rice in Southern United States without having an adverse impact on adjacent aquatic or estuarine habitat.

A. The registrant states that there is no evidence to show that adverse effects were observed that are attributable to Bolero. (p. 1, para. 1)

Response: The methods used in the study (i.e., sampling various estuarine populations) were intended to indicate whether or not these populations decreased during the year(s) when Bolero was applied compared to a baseline year when Bolero was not applied. The number of individuals of each species/taxa was to have been an indication of relative abundance of the total population and was expected to allow a comparison of populations from one year to the next. Based on this, when fewer individuals of a particular species were collected in the treatment year than were collected in the baseline year, this would indicate a decline in the total population. A decline is interpreted as an adverse effect.

B. The registrant points out that the declines that were observed during the study can be attributed to other factors. (p. 1, para. 1)

Response: Seasonal variation was not a factor in this study since sampling in each year occurred in the same season. The abbreviated sampling in the third year has been considered and is not the cause of the effects reported in this review. The fact that salinity and temperature may have been influential does not eliminate the possibility that Bolero was the cause. Since the adverse effects occurred in the same years when Bolero was used and was present in the estuarine system (as demonstrated by chemical analysis), it is still possible that Bolero caused the adverse effects.

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Since the purpose of the study was to determine if Bolero could be used without causing adverse effects and adverse effects did occur, the study failed to negate the hazard.

C. Both the registrant and EEB agree that the data from the reference site will be excluded since thiobencarb residues were detected in various samples. (p. 2, para. 1)

D. The registrant claims that Bolero does not accumulate to levels considered harmful to biological organisms. (p. 2, para. 3)

Response: There are no data available to show what the hazards are from bioaccumulated residues of Bolero. The laboratory studies available to EEB are all designed to measure the effects of ambient exposure. Therefore, there is no justification for any statement concerning safety or hazard of bioaccumulated residue. However, adverse effects based on sampling results did occur concurrent to the presence of Bolero. Therefore, it is assumed that the levels to which these organisms were exposed were harmful. The adverse effects are summarized below:

1. A fish kill occurred in 1984. "Dead Brevoortia patronus were mistakenly thought to be flower petals that had fallen and sunk (at station IV) on 3 May, 1984. Closer examination of the flower petals on 4 May, 1984 revealed they were dead B. patronus."

2. The percent of gravid shrimp per total shrimp caught decreased during the first treatment year compared to the baseline year. The decreases were 46 percent, 54 percent, and 7 percent at stations 1, 2, and 4, respectively. There was a 15 percent increase at station 3, but an average decrease of 23 percent at all four stations. The decrease at station 2 was significant based on the Wilcoxon signed rank test.

3. Two fish species, Gambusia affinis and Dormitator maculatus, decreased in numbers per sample day during both treatment years. This decrease is based on samples collected between May and August, so it is not attributable to an abbreviated sampling schedule. These species were not dominant; G. affinis made up 5 percent of the fish collected in samples in 1982 and D. maculatus was less than 1 percent.

4. There were declines in certain species of benthic organisms as determined by Ekman grab samples.

E. The registrant states that thiobencarb does not accumulate in water. (p. 2, para. 4)

Response: Accumulation is defined as the increase in residue levels with repeated discharge or release. Bolero accumulated in water in 1983 at station 1 and 3 where levels rose with repeated exposure from drift and runoff. It accumulated in water in 1984 at stations 1 and 4 where concentrations increased from 5/1 to 5/2. See tables 3 to 14b of the Data Evaluation Report (Aug. 6, 1985) for complete residue data.

F. The registrant states that thiobencarb does not accumulate in sediment. (p. 2, para. 5)

Response: Bolero also accumulated in sediment in 1983 at stations 2 and 3 throughout June. Bolero accumulated in sediment in 1984 at station 1 throughout May. See tables 3 to 14b of the Aug. 6, 1985 DER for complete residue data.

In an open system such as this one, residues in water samples would be expected to decline rapidly. This decline would not necessarily be from degradation but from dilution as contaminated water moved out into the Colorado River and was replaced by uncontaminated water. Even with this dilution, residues in water at station 1 during May and June of 1983 remained close to or greater than the Daphnia magna NOEL of 1 ppb for more than 30 days. The D. magna MATC was > 1 < 3 ppb. The observed effect at 3 ppb was no production of young. The levels in water during April and May, 1984, at station 1 remained at concentrations approaching or greater than this 3 ppb effect level. The residues in sediment persisted at levels of detection (10 ppb) throughout the summers of both treatment years. This level (10 ppb) is greater than the Daphnia magna 21-day NOEL of 1 ppb and greater than the 21-day LC_{50} of 9 ppb. Based on the laboratory data, the levels of Bolero in water and sediment were high enough to cause serious reproductive impairment and even mortality to aquatic invertebrates.

G. The registrant states that reductions in certain species of fish were due to an abbreviated sampling program. (p. 3, para. 2)

Response: The effects to fish were not high on the list of concerns; however, numbers of certain species did decline over the two treatment years. This decline was real (i.e., not due to abbreviated sampling during the second treatment year). Gambusia affinis numbers from all three stations combined between April and August declined each year with an average of 24.4, 20.9, and 4.2 fish per sample date for 1982, 1983, and 1984, respectively.

During 1982, Gambusia affinis made up about 5 percent of the total fish collected. Dormitator maculatus numbers/ sample date also declined at each station over the 3-year study. These declines may have been caused by some natural factors such as salinity changes, as the registrant poses; however, they could also have been caused by Bolero. The study was conducted to show that Bolero would not cause the adverse effects that these declines suggest. Since the declines occurred when Bolero was present, the causative relationship is possible.

H. The registrant indicates that those species showing declines represent small percentages of total fish caught. (p. 3, para. 3)

Response: Granted these fish populations represent a small percentage of the sampled community, this does not mean these species are unimportant in this community, and more importantly the species that exhibited reductions may represent fish with greater sensitivity to Bolero. If another community which was comprised primarily of more sensitive species was exposed to these levels of Bolero, serious community effects may occur.

I. The registrant states that reductions and fluctuations are attributable to salinity levels. (p. 3, para. 6)

Response: Here again, the declines observed may or may not have been caused by natural factors. In any case, the object of the study was to determine if Bolero could be used on rice without having an adverse effect on aquatic organisms. Populations declined, numbers of gravid shrimp were reduced and fish were killed, therefore, the study does not negate our concern.

J. The registrant states that there was no reduction in grass shrimp populations during the treatment year. (p. 4, para. 3)

Response: This discussion and the discussion in the Addendum Report, Appendix 1, both fail to address the point. The point is that percent of gravid shrimp were substantially lower in the treatment year compared to the baseline year. The discussion that percentages may be misleading (page 3, paragraph 3 of Appendix 1) only applies to total populations. Indeed, if 100 percent of a population of 2 was ovigerous it would not be as productive as a population of 100 with 25 percent being ovigerous. However, the percentages used in EEB's conclusions apply to samples from a population which was, according to sampling, substantially greater than 2 or even 100 individuals. Therefore, if the percentage of ovigerous

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shrimp in samples decrease from baseline year to the treatment year, it represents a real decline in ovigerous shrimp in, and reproductive potential of, the population.

The concentrations of Bolero were high enough to have caused the decline in percentage of ovigerous shrimp and the declines were observed. Therefore the study supports the contention that Bolero, when used on rice, will cause chronic adverse effects to shrimp. The fact that total numbers of shrimp apparently did not decrease based on samples may mean that new individuals moved in from untreated areas or that the population declines that would have occurred from reduced reproduction did not show up during the "abbreviated" sampling conducted during the third year.

K. The registrant states that EPA has misused the Chocolate Bay study data. (p. 4, para 7)

Response: It is made clear in the January 9, 1981, memorandum to Richard Mountfort that the measured residues in the small waterways draining rice fields in the Chocolate Bay study represent aquatic habitat conditions whether there were any organisms in that particular waterway or not. In a different location, such a waterway may be a slow-moving stream supporting a healthy aquatic community. The results of the Chocolate Bay study show that Bolero will persist in rice fields and transport to adjacent waterways over a several day period thus posing both acute and chronic hazards to aquatic organisms. See copy of January 9, 1981, memorandum attached.

L. The registrant states that the data clearly show that thiobencarb had no adverse effect. (p. 6, para. 2)

Response: Since the fluctuations occurred concurrent to the presence of Bolero, the causative relationship is possible. There is no way to conclude that "biological monitoring data clearly show that thiobencarb had no adverse effects on aquatic invertebrates, fish and shrimp populations." A fish kill occurred, there were definite declines in two fish species over the 2-year period, Gambusia affinis and Dormitator maculatus. There were also fewer gravid shrimp per total shrimp collected in 1983 compared to 1982 sampling.

M. The registrant states that laboratory data do not indicate species sensitivity differences. (p. 6, para. 4)

Response: The differences in sensitivity are demonstrated by laboratory studies. The laboratory studies demonstrate that juvenile Menidia menidia are much more sensitive to

Bolero than the juvenile sheepshead minnow. Furthermore, this sensitivity difference can justly be included in an extrapolation from acute results to chronic results. Thus, since Menidia menidia are more acutely sensitive to Bolero than the sheepshead minnow, it is expected that Menidia menidia are more chronically sensitive; and by the same factor.

N. The registrant states that Bolero has been used for many years without adverse effects. (p. 6, para. 4)

EEB has not seen any biological field study data from Japan. If other field studies measuring chronic effects of Bolero have been performed, they should be submitted for review. Otherwise, these subjective judgments, without supporting field or laboratory test results, are not scientific and cannot be used in a risk assessment.

O. The registrant points out that the levels of thiobencarb only exceed the California Fish and Game Department fish health effect action level of 24 ppb once. (p. 7, para. 1)

Response: Indeed, the residue levels in water in the Matagorda study did exceed the 24 ppb action level, and the residue levels in the Chocolate Bay study exceeded this action level in all areas (I, II, III, IV, and V). Whether California requires flood water on Bolero treated fields to be held for 6 days or 14 days is irrelevant since no such restrictions could be enforced in the Southern United States rice growing region.

P. The registrant states that the label restriction to protect the endangered mussel species is not justified. (p. 9, para. 1)

EEB has reinitiated consultation with the United States Fish and Wildlife Service (USFWS) with the additional information. If USFWS concurs with the registrant, the restrictive labeling will not be required. However, until EEB has received such a response from USFWS, the restrictive labeling is necessary. Ignoring this requirement means noncompliance with the Endangered Species Act.

Q. The registrant states that EEB approved an abbreviated sampling schedule in 1984. (p. 10, para. 1)

Response: EEB agreed that certain sampling methods could be discontinued. However, we did not agree to an abbreviated sampling schedule. Furthermore, EEB did not have the gravid shrimp data available for evaluation at that February 22, 1984, meeting and the data that were available were in such a form as to preclude careful analysis in the

time available. The final report for 1983 was not submitted until February 28, 1985, and it was at that time that EEB restructured the data to detect adverse effects and studied the gravid shrimp results.

R. The registrant claims to have reformatted the data. (p. 10, para. 5)

Response: Some of the data have been reformatted. However, only a few of the fish species data were put into a different format. The gravid shrimp data were placed on 3 year charts, one for each station. However, the results were reported as total numbers of ovigerous females rather than a percentage of total shrimp sampled. A percentage is a more accurate description of this measurement since a sample represents the population from which it is taken and the percent of gravid shrimp in that sample is indicative of the percent of gravid shrimp in the entire population.

The baseline report submitted by Chevron dated December 1983, reported gravid shrimp data only from August 3, 1982, on. In the charts presented in the Appendix I, submitted January 8, 1986, gravid shrimp data are shown from early April of 1982. This additional gravid shrimp data must be submitted.

S. The registrants disagrees with EEB's conclusion. (p. 10, para. 9)

Response: The conclusion is based on analysis of the results of the Matagorda study. ~~results.~~ An abbreviated sampling schedule in 1984 cannot be justification for ignoring the adverse effects that were observed. The possibility that salinity or temperature effects may have caused the observed changes may detract from the credibility of the study, but the fact that these natural phenomena occurred does not "clearly show that there were no adverse effects on the aquatic community."

T. The registrant references interviews with County agents, Extension agents, and university researchers who claim that thiobencarb has had no adverse effect on nontarget organisms. (p. 10, para. 10)

Response: Subjective judgment without supporting field data cannot be used in a risk assessment. However, EEB requires a list of the County agents, Extension agents, and university researchers that were interviewed along with their addresses and telephone numbers. The individuals will be contacted in an effort to determine their qualifications in assessing pesticide hazard and the basis for their statements.

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The data provided to EEB has shown that adverse effects occurred concurrent to the presence of Bolero and that hazardous residues of Bolero occurred.

U. The registrant requests that the study category be upgraded to core. (p. 11, para. 3)

Response: The Matagorda study provides useful information but its deficiencies preclude any classification upgrading.

V. The registrant again questions the validity of the labeling to protect the endangered mussel. (p. 11, para. 5)

Response: The labeling to protect the endangered fat pocketbook pearly mussel (Potamilus = Proptera capax) was required because the USFWS concluded that the use of Bolero on dry seeded rice would jeopardize this species. According to the USFWS consultation opinion dated March 6, 1981, the fat pocketbook pearly mussel is found in the White and St. Francis Rivers in Arkansas. However, more recent information indicated that the only remaining viable population of P. capax is in the "Old St. Francis River" which is separated from the New St. Francis River by a levee extending from the Mississippi River Levee north to the Missouri State line. Based on the explanation provided by Chevron, it may be that the restrictive labeling presently required for Bolero 8 EC and Bolero 10 G is not appropriate. According to Chevron, in St. Francis County, no rice water flows into the Old St. Francis River. Further, they claim that only approximately 1400 acres of rice drains into the Old St. Francis River in Cross County.

However, protection of endangered species means avoiding impact not only to areas where the organisms ~~it~~ actually occur but also to areas where they could reinhabit, both naturally and through artificial transplant. EEB will reinitiate consultation with USFWS providing this additional information. Based on their response, EEB may modify the restrictive labeling requirement.

W. The registrant feels EEB's conclusions are totally unsupportable. (p. 12, para. 1)

Response: Based on the available data, EEB concludes that the Matagorda study:

1. Is supplemental;

2. Does not refute the concern for impact to aquatic/ estuarine nontarget organisms;

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3. Suggests that adverse effects occurred during the 2 years when Bolero was used compared to the baseline year.

The study is supplemental because of the high reported residues of Bolero in some of the baseline year samples of fish and shrimp, the "abbreviated" sampling schedule during 1984, and the use of other pesticides in the area that could have caused the observed declines. The additional "factors" mentioned by Chevron as likely causes of the changes that were observed do not improve the validity of the study. Rather, they cast more doubt on its scientific value.

The concern which triggered this study was the potential for adverse acute and chronic effects to aquatic and estuarine organisms. This was based on laboratory toxicity data and results of a previous field study conducted in the Chocolate Bay drainage basin. In that study, five different areas were treated with Bolero. Then, as these areas were drained, the receiving waterways were sampled for chemical residues. Tables 1 through 7 show the measured residues. Based on laboratory toxicity test results, such residues would be expected to cause serious adverse acute and chronic effects to fish and aquatic invertebrates. The following tests were conducted with technical Bolero.

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Species	Test Type	Results
Mysid shrimp	life cycle	MATC > 19 < 30 ppb 28-day mortality significantly greater at 30 ppb Time to brood pouch formation increased at 96 ppb Number of offspring reduced at 50 ppb.
Mysid shrimp	LC_{50}	288 ppb
Daphia magna	48 hr LC_{50}	101 ppb
	21-day LC_{50}	9 ppb
	life cycle	MATC > 1 < 3 ppb there was virtually no young production at 3 ppb.
Sheepshead minnow	early life stage	LEL 150 ppb No NOEL was determined as 150 ppb was lowest level tested. Adverse effects: - significant decrease in growth of juveniles at 150 ppb. - significant mortality of juvenile sheepshead minnows over 28-day period at 230 ppb. - significant effect on hatching success at 600 ppb.
Sheepshead minnow	96-hr LC_{50} with juvenile	659 ppb
Menidia menidia	96-hr LC_{50}* with 7-day old juvenile flow-through	199 ppb (binomial) 221 ppb (moving average) 204 ppb (probit)

extrapolated LEL = 45 ppb

*Borthwick, Patrick W., James M. Patrick, and Douglas P. Middaugh. 1985. Comparative Acute Senstivities of Early Life Stages of Atherinid fishes to Chlorpyrifos and Thiobencarb. In Arch. Environ. Contam. Toxicol. 14 (1985)

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In area I (table 1 & 2), residues as high as 51 ppb occurred in Halls Bayon 14 days after a Bolero application. Continuous residues from 5 to 51 ppb were measured for 13 days (April 7 to April 20).

In area II (table 3), residues of 64 and 83 ppb were measured in Halls Bayon 14 days after Bolero applications. Residues declined to below detection limits (2 ppb) within 13 days of these measurements.

In area III (table 4), a residue of 140 ppb was measured in Halls Bayon 13 days after treatment.

In area IV (table 5) residues 410 and 400 ppb (after 7 and 9 days, respectively) were measured at F_1, the point where the rice field drained into Pleasant Bayon. After 15 days posttreatment, 51 ppb was measured again at F_1.

In area V_a (table 7), residues of 68 and 7 ppb were measured 8 and 22 days, respectively following treatment.

The Chocolate Bay study amply demonstrates that Bolero will persist and will transport from treated rice fields at levels shown to be acutely and chronically toxic to aquatic invertebrates and occasionally at levels greater than the fish Lowest Observed Effect Level. As stated in the January 9, 1981, memorandum from Ann Stavola to Richard Mountfort, this study indicates that criteria for initiation of Special Review, as defined in 40 CFR section 154.7, have been exceeded.

Thus, the purpose of the Matagorda field study was to determine if Bolero could be used on rice in Southeastern United States without causing adverse effects to fish and aquatic/ estuarine invertebrates. To that end, the study was designed to measure populations of fish and invertebrate through sampling and to measure the effects, if any, of Bolero on shrimp reproduction. Shrimp reproduction potential was to be determined by counting the number of gravid shrimp in each sweep net sample. Adverse effects would show up as declines in populations, species richness, or reproductive potential as determined by comparing sample results from the baseline year with treatment years one and two. The following summarizes the declines which occurred based on sampling.

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1. A fish kill was observed on May 3, 1984, at station IV. Dead Brevoortia patronus were found in the water where Flap Gate IV drained into the bayou from field 24. Field 24 had been treated on April 19, 1984, and flushed on May 1, 1984. Dead fish collected and subjected to chemical analysis contained residues of Bolero at 3.5 and 3.6 ppm. This fish kill is attributed to Bolero.

2. The number of gravid shrimp per total number collected declined in treatment year 1 compared to the baseline year. The average percent by station was:

	Year		
Station	1982	1983	
1	7.8	4.2	46% decrease
2	8.7	4.0	54% decrease
3	11.0	13.0	15% increase
4	23.3	21.7	7% decrease

Average change: 23% decrease

This is based on a comparison of sample results collected from August through November in both years.

3. Two species of fish experienced declines in both treatment years.

	All Stations Combined Number/Sample		
Species			
Gambusia affinis	24.4	20.9	4.2
Dormitator maculatus	3.3	0.4	0

This was based on samples taken between April and August, when sampling was discontinued in 1984. That includes 10 samples in 1982 and 1983 and 7 samples in 1984.

4. The total number of fish species/taxa (species/taxa richness) declined from baseline year to the two treatment years.

	82	83	84
Taxa	21	19	14

This also is based on sampling from April to August in all three years.

5. Based on sweep net samples for invertebrates, no species/taxa showed a marked deline over the two treatment years at all stations. However, the species/taxa richness declined from the baseline year through the two treatment years.

	1982	1983	1984
Species/Taxa No.	41	38	31

This is based on sampling from April to August for all three years.

Missing Data

EEB was not provided with gravid shrimp data from April to July 1982. If such data exist, they must be submitted.

Summary of Study Conclusion

The purpose of the Matagorda study was to determine if Bolero could be used on rice in Southeastern United States without causing adverse effects to aquatic/estuarine organisms. To do this, the study results would have to show that no adverse effects, attributable to Bolero, occurred when Bolero was applied and present in the water system. Contrary to what Chevron claims, the study does not clearly show this. Adverse effects were observed (see 1 through 5 above) that are the type Bolero would be expected to cause. The presence of other factors which may have influenced the study results does not exonerate Bolero. The study does not negate EEB's presumption of hazard.

103.0 Conclusion

In California, Bolero is not expected to have an adverse effect on aquatic organisms because:

1. The State of California has limited the total pounds of Bolero that can be applied per year.

2. The flood water is held from 6 to 14 days to allow degradation.

The restrictions were implemented mostly to eliminate a "taste" caused by Bolero in drinking water taken from the Sacramento River. To preclude the taste, the maximum levels in the river must be no greater than 1 ppb (telephone conversation, October 1, 1986, with Brian Finlayson, California Department of Fish and Game, Sacramento, CA, Phone #: (916) 355-0978). As long as the levels of thiobencarb in the Sacramento River are at that level or lower, no adverse effects to aquatic organisms will occur.

However, in the Southern United States, the use of Bolero on rice may have an significant effect on aquatic (freshwater and estuarine) organisms. The Matagorda field study does not negate EEB's concern for aquatic invertebrates and fish. Rather, it supports the contention that such use will result in damage to some fish populations and even more damage to freshwater and estuarine invertebrates.

The EEB recommends that the registrant perform post-registration residue monitoring to determine what levels of Bolero are occurring in aquatic habitat adjacent to rice fields. The results of this monitoring will help determine if the concentrations observed in the Matagorda study are typical of, less than or greater than concentrations occurring in aquatic habitat throughout the southern rice growing region. The registrant must submit a protocol for approval that meets, at a minimum, the following criteria.

1. At least 8 separate study sites throughout the southern rice producing area must be studied. These sites must be chosen from areas characterized by maximum exposure potential. For example, soil type must encourage runoff rather than absorb contaminated water.

2. Each site must include at least 200 acres of treated rice, all of which drains into one relatively small (first order) stream. The drainage basin of this waterway must contain more than 50% rice fields which then must all be treated with Bolero.

3. The receiving stream must be within 100 yards of the nearest treated field and must contain a natural and viable aquatic or estuarine community.

4. Each site must be treated by air at the maximum label rates.

5. Residues must be measured in fish, water and sediment samples. Sediment samples must be collected by core sampler and must be analyzed in 1 cm layer segments to ensure that concentrations in top layer are measured seperately.

6. Sampling must begin immediately after each application and continue daily for 3 days. Then a schedule of one sample per week may be maintained. However, additional sampling is required after each rain of greater than 1 inch in a 24-hour period or after any intentional discharge of floodwater whether it was for rice management purposes or to simulate overflow from heavy rains. In these cases, samples must be collected daily until 3 days after the rain stops or the discharge ceases. Monitoring must continue through, and include sampling from, the final discharge when field is drained for harvest.

7. Three subsamples must be collected from each sampling station on each sampling day. The subsamples must not be combined, they must be analyzed individually to determine "between sample" variation.

8. Sample stations must be established just upstream and just downstream from each outflow (where floodwater enters the stream) and at several points (i.e 50, 100, 200, 400 and 800 yards) downstream. Sampling stations must be established at approximately 1000-yard intervals along the waterway to the mouth of the treated drainage basin, i.e. where it enters a larger untreated basin.

9. If there is no rainfall (greater than 2 inches in 24 hours) within 5 days after treatment, 2 inches of floodwater must be added to the treated rice fields. If less than 2 inches of rain fall in that time period, the difference must be made up with irrigation. Two inches, whether from irrigation or from rainfall, must then be discharged from the fields within one day to simulate a substantial overflow. Samples must be collected beginning at day 0 (when discharge begins) and continue for 3 days after the discharge is stopped. Thereafter, the weekly schedule may be assumed. The requirement to intentionally discharge water is in lieu of continuing the study long enough (i.e. several years) to ensure that several rainfalls (>2 inches in any 24-hour period) occur shortly (<6 days) after treatment.

10. Drift must be measured at each field at the time of application to quantify how much a.i. leaves the field via this route. This would involve the use of drift cards placed around the fields to anticipate drift in any direction.

11. A detailed protocol for each sampling site must be submitted. This protocol must include:

a. The location of the site, with USGS 7.5 minute series topography maps showing the treated fields and stream to be sampled;

b. The proposed sampling schedule, sampling methods and sample handling procedures;

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c. The proposed method for chemical analysis and where the analysis will be performed. Sampling methods must be sensitive enough to detect Bolero in both water and sediment at the lowest laboratory NOEL, i.e. 1 ppb.

d. The approximate dates when pesticide treatment and monitoring will be conducted; and

e. Application rate and methods. This must include specific identification of use rate, application equipment such as nozzle type and pressure, and altitude of application.

The protocol must be reviewed and approved by both the EEB and the Exposure Assessment Branch before the study is initiated. It is possible that the proposed protocol will require modification based on that review.

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Attachments
-2/10/87 Peer Review of EEB response to Chevron
-Data Evaluation Report dated August 6, 1985
-Chevrons response to EEB's 8/6/85 DER
-1/9/81 Memorandum from Ann Stavola to Richard Mountfort
-USFWS 3/6/81 opinion on the use of Bolero on rice