Paul E. Helliker
Director

Department of Pesticide Regulation

Gray Davis
Governor

Winston H. Hickox
Secretary, California Environmental Protection Agency

MEMORANDUM

TO: Gary Carlton, Executive Officer
Central Valley Regional Water Quality Control Board
3443 Routier Road
Sacramento, California 95827

FROM: Paul E. Helliker Paul Helliker
Director
(916) 445-4000

DATE: February 5, 2002

SUBJECT: RESPONSE TO RESOLUTIONS NO. 5-01-074

As part of the Central Valley Regional Water Quality Control Board's review of the Department of Pesticide Regulation's (DPR's) Rice Pesticide Program in 2001, the Board asked DPR to evaluate and report on the feasibility of extending the current water-holding requirement for molinate- and thiobencarb-treated fields. In response to this request, DPR staff reviewed the literature regarding the effects of water-holding periods on rice and pesticide dissipation in California (Attachment 1). DPR asked for the California Rice Commission's (CRC's) opinion on extending water-holding periods (Attachment 2). CRC asked the registrants of molinate (Attachment 3) and thiobencarb (Attachment 4) for their comments on extending the water-holding periods.

DPR's review of the literature indicates that extending the water-holding period will result in further dissipation of the pesticides, but the effect is small after the first 30 days. The registrants agree with this observation. DPR could not find any information in the literature about the impact of extended water-holding periods on California rice yields and quality. However, the CRC expresses concerns about the impact of salinity and increased temperature on rice yields if water-holding periods are extended.

I have included Figures 3, 4, 5, and 6 from DPR's report entitled, "Information on Rice Pesticides" (December 31, 2001) submitted to the Board in January 2002. These figures clearly indicate that the highest concentrations of molinate and thiobencarb detected at monitoring sites are associated with the application of these pesticides to a large number of acres in a short period of time. The most probable source of these detections is drift during application and/or water seepage from treated fields. Therefore, I believe that extending the water-holding period beyond the current requirements will not significantly reduce the concentrations of molinate and thiobencarb detected at the monitoring stations.

The CRC letter (Attachment 2) outlines the efforts on the part of the rice industry to increase enforcement of pesticide use requirements and reduce the impact of drift during application. DPR appreciates the efforts of the rice industry to protect water quality, and we believe the regulatory requirements currently in place and the stewardship activities by the rice industry will improve water quality protection during the coming rice growing season.

If you have any questions, please call me.

Attachments

cc: Dr. John Sanders, Chief, DPR Environmental Monitoring Branch (w/Attachments)

Figure 3: Acres treated with molinate in Colusa and Glenn Counties and concentrations of molinate in the Colusa Basin Drain near SR20 in 2001

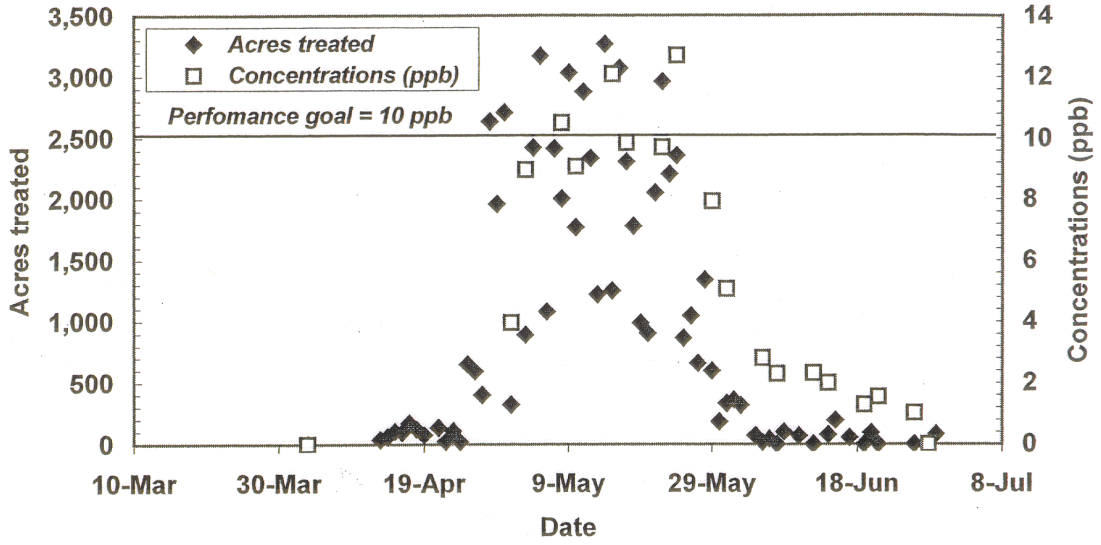


Figure 4: Acres treated with thiobencarb in Colusa and Glenn Counties and concentrations of thiobencarb in the Colusa Basin Drain near SR20 in 2001

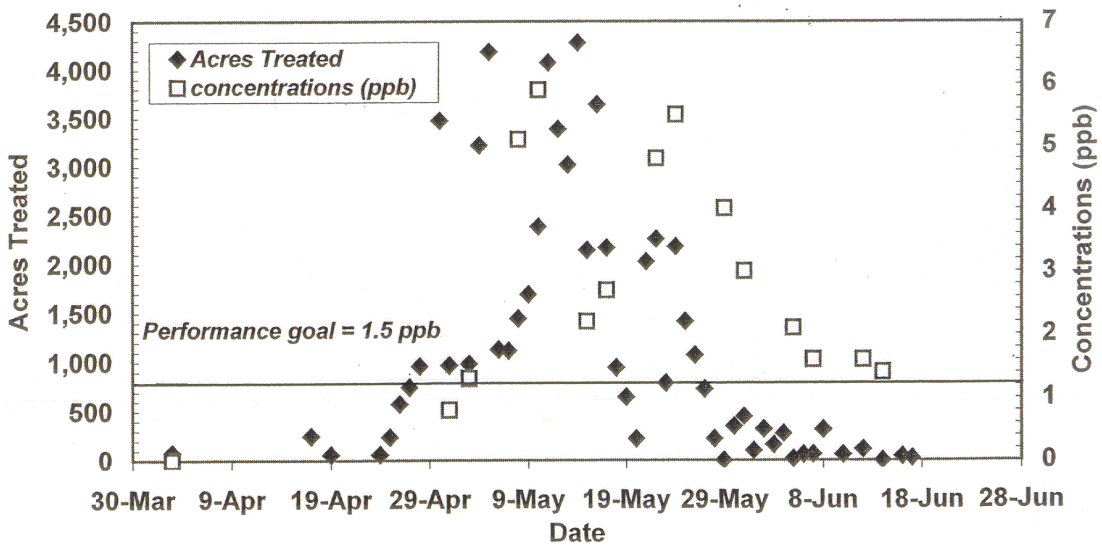


Figure 5: Acres treated with molinate in Butte County and concentrations of molinate in Butte Slough in 2001

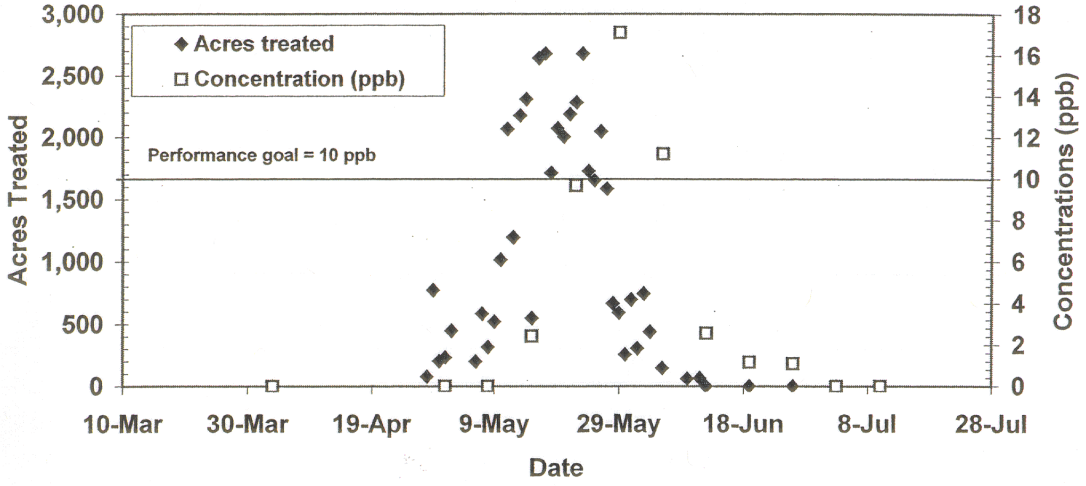
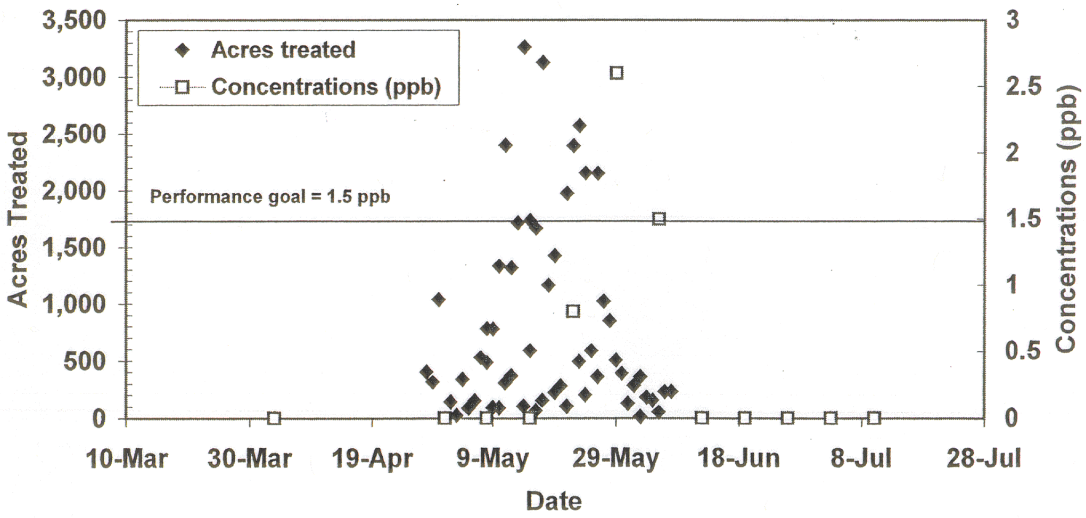


Figure 6: Acres treated with thiobencarb in Butte County and concentrations of thiobencarb in Butte Slough near SR20 in 2001



Department of Pesticide Regulation

Paul E. Helliker
Director

Gray Davis
Governor
Winston H. Hickox
Secretary, California Environmental Protection Agency

MEMORANDUM

TO: John S. Sanders, Ph.D., Chief
Environmental Monitoring Branch

FROM: Randy Segawa Segawa
Senior Environmental Research Scientist, Supervisor
(916) 324-4137

DATE: January 15, 2002

SUBJECT: REVIEW OF LITERATURE REGARDING EFFECTS OF WATER HOLDING TIMES ON RICE AND PESTICIDE DISSIPATION

Background

The Central Valley Regional Water Quality Control Board reviews the Department of Pesticide Regulation's (DPR's) Rice Pesticides Program every three years to evaluate the Program's ability to meet water quality goals. During the Board's review of the Program in 2001, they asked DPR to evaluate the ability of rice growers to hold water on rice fields beyond the current requirement and report our conclusions in 2002.

DPR's Rice Pesticides Program is an effort to protect water quality in receiving waters adjacent to rice fields, including agricultural drains and the Sacramento River. DPR and county agricultural commissioners enforce specific management practices designed to meet water quality performance goals aimed at protecting receiving waters from aquatic toxicity and protection of raw drinking water from rice pesticides. These water quality performance goals were established by the Central Valley Regional Water Quality Control Board and are contained in its Water Quality Control Plan (Basin Plan), Central Valley Region for the Sacramento River Basin.

One of the management practices used to meet water quality performance goals is a water holding requirement. Rice growers are required to hold water on their fields following application of rice pesticides, which have been shown to be toxic to aquatic organisms. Holding periods allow for degradation of pesticides to occur, reducing concentrations contained in rice field runoff that enters waterways adjacent to treated fields. Holding periods range from 24-30 days, depending on the pesticide.

The acreage planted with rice has increased over the last few years, leading to increased use of pesticides on rice. Several pesticides frequently exceed the water quality performance goals at the monitoring site for the Colusa Basin Drain. This review of the literature explores the advantages and disadvantages of increasing the holding times to further reduce the pesticide concentrations in runoff water.

Summary of Pertinent Research

Unless noted, all studies were conducted in the Sacramento Valley of California.

Molinate - Ross, et al. (1984) measured dissipation of molinate (Ordram) in rice field water. However, the water holding time for this study was six days, so this data is not pertinent. Curry, et al. (1989) measured dissipation of molinate in rice field water over a 78-day period. This study determined dissipation in a 1.4-acre test plots treated with 5 pounds per acre, followed by a second application of 5 pounds per acre a week later. The highest measured concentration in water was 581 parts per billion (ppb). Concentrations fell below the 10 ppb detection limit 16-29 days following application. The water concentration data past 15 days should not be used in calculating the dissipation rate because the detection limit was much higher than most other methods. Between the first and fifteenth day, the half-life was 3 days. Johnson and Lavy (1995) measured molinate dissipation in Arkansas test plots. This study determined dissipation in 25-m^2 test plots treated with 5 pounds per acre. Water was held in the test plots for the entire 49-day study period. The amount of molinate in water was expressed as a percent of the application rate rather than concentration. The water dissipation half-life was 5 days.

Thiobencarb - Sakamoto (1980) measured weed control in several rice fields after application of thiobencarb (Bolero). One test field was not drained until harvest, with the water level maintained at 8-12 inches. Thiobencarb was applied to this 123-acre field at a rate of 4 pounds per acre. Thiobencarb provided 75-90% control of barnyard grass and sprangletop in this test field. The rice yield was 6290 pounds per acre (dry weight), approximately 10% less yield when compared to thiobencarb-treated fields without an extended holding period. No information was provided regarding the quality of the rice. Thiobencarb water concentrations were not measured in this study. Ross, et al. (1984) measured dissipation of thiobencarb in rice field water. However, the water holding time for this study was six days, so this data is not pertinent.
Ho (1990) also measured dissipation of thiobencarb in rice field water. This study determined dissipation in a 10.6-acre test plot (part of a larger commercial field) treated with 4 pounds per acre. Irrigation water was allowed to move into a fallow field during the 92-day study period. Water concentrations were measured within the test plot as well as the fallow field. The highest measured concentration was 438 parts per billion with a half-life of 8.7 days. No information was given regarding the yields or plant health in the test plot.

Cyhalofop-butyl - Knuetson and Foster (1999) measured the dissipation of cyhalofop-butyl (Clincher) and its breakdown products in rice test plots. The active agent of cyhalofop-butyl is the breakdown product cyhalofop-acid. This study determined dissipation in 0.13-acre test plots treated with 210 grams per hectare (0.2 pounds per acre), followed by a second application of 310 grams per hectare (0.3 pounds per acre) a week later. Water was held in the test plots for the entire 71-day study period. The highest measured concentration for cyhalofop-acid in water was

171 parts per billion with a half-life of 1.82 days. No information was given regarding the yields or plant health in the test plots.

Carfentrazone-ethyl - FMC Corporation has conducted two aquatic dissipation studies for carfentrazone-ethyl (Shark; AIM herbicide) and its breakdown products in rice test plots. Summer and Saxena (1996) determined dissipation in a test plot treated with 0.2 pounds per acre, and Holihan (1998) determined dissipation in a 0.09-acre test plot treated with 0.3 pounds per acre of carfentrazone-ethyl. Water was held in the test plots for both studies for the entire 70 or 80-day study period. The highest measured concentration of total residue (carfentrazone-ethyl and metabolites) in water for the Summer and Saxena study was 59 ppb, with a half-life of 5 days. The highest measured concentration in water for the Holihan study was 319 parts per billion, with a half-life of 10 days. No information was given regarding the yields or plant health in the test plots.

Conclusions

1. All studies demonstrated an exponential decline in concentration, with half-lives ranging from 2 to 9 days (see table). These exponential decline curves are characterized by relatively large decreases in concentration during the first few weeks of application, and a relatively smaller decrease as time increases. For example, if the peak concentration of 100 ppb occurs on the day of application, with a half-life of 10 days, the concentration decreases by more than 87 percent after 30 days to 12.5 ppb. However, between 30 and 60 days, the concentration only decreases by 11 percent, from 12.5 ppb to 1.6 ppb. In other words, increasing the water holding time from 30 to 60 days has a much smaller effect on concentration compared to increasing the holding time from 0 to 30 days.

2. Little information was found regarding the effect of long water holding periods on rice quality and yield.

3. While longer holding periods may have minimal effect on water concentrations, alternative water management systems for rice fields that allow longer holding periods may be feasible. Hill et al. (1994) conducted a survey of water management practices in California. Twenty-one percent of the respondents used water management systems that prevent discharge of tailwater for extended periods of time. It may be possible for other growers to adopt these alternative water management practices.

Summary of Pesticide Dissipation Rates in Water of Rice Fields.

Pesticide	Water Half-Life (days)	Percent Remaining After 30 Days
Molinate	5	1.6
Thiobencarb	9	9.2
Cyhalofop-butyl	2	0.3
Carfentrazone-ethyl	7.5	6.3

References

Curry, K.K., B.D. Riggle, and R.E. Hoag. 1989. Ordram 8-E aquatic field dissipation study for aquatic use post-flood molinate. Report Number RR 89-025B. ICI Americas. Western Research Center, Richmond, CA.

Hill, J.E., S.M. Brouder, S.R. Roberts, J.F. Williams, S.C. Scardaci, and C.M. Wick. 1994. A Survey of Water Management Practices of California Rice Growers. J. Nat. Resour. Life Sci. Edu. Vol 23: 119 - 124.

Ho, B. 1990. Aquatic Field Dissipation of Bolero 10G in Rice. Laboratory Project Identification T-7230. Valent U.S.A. Corporation, Walnut Creek, CA.

Holihan, J.C. 1998. F8426 DF herbicide - aquatic field dissipation. Report Number P-3311. FMC Corporation, Princeton, NJ.

Johnson, W.G. and T.L. Lavy. 1995. Persistence of Carbofuran and Molinate in Flooded Rice Culture. J. Environ. Qual. Vol 24: 487 - 493.

Knuetson, J.A., D.R. Foster. 1999. Field dissipation of cyhalofop-butyl in USA rice culture systems. Laboratory Study ID ENV98033. Dow AgroSciences LLC, Indianapolis, IN.

Ross, L.J., R.J. Sava, and R.J. Oshima. 1984. Environmental fate of selected rice herbicides (thiobencarb and molinate) under field conditions. California Department of Food and Agriculture, Sacramento, CA.

Sakamoto, S.S. 1980. Bolero 10G Evaluation on California Rice Fields, EPA EUP Permit #239-EUP-78. Chevron Chemical Company.

Summer, S.J. A.M. Saxena. 1997. Carfentrazone-ethyl (F8426) herbicide - aquatic field dissipation. FMC Study Number 842E4296E1. Battelle, Columbus OH.

Attachment 2

CALIFORNIA RICE COMMISSION

January 22, 2002

Mr. John Sanders
California Department of Pesticide Regulation
P.O. Box 4015
Sacramento, CA 95812-4015

RE: Response to CVRWQCB Resolution No. 5-01-074 – holding water extension

Dear Mr. Sanders:

The California Rice Commission (CRC) is writing to respond to the request made by the Central Valley Regional Water Quality Control Board in Resolution No. 5-01-074: "…to evaluate and report on the feasibility of holding all water on molinate and thiobencarb-treated rice fields in the Colusa Basin watershed until 15 June to minimize discharges and peak concentrations at times when seepage and aerial drift enter surface waters and performance goals have not been met."

It is our opinion that extending the present 28-day water holding period for molinate and the 30-day water holding period for thiobencarb would not result in significant improvement in surface water concentrations, and may actually increase them, while it would cause unintended negative consequences in rice field management. In preparing this response, the CRC consulted with University of California rice farm advisors, Randall (Cass) Mutters and John (Jack) Williams, who provided much of the specific information summarized below.

1. Persistence of molinate and thiobencarb in rice field water

The CRC asked the chemical manufacturers, Syngenta Crop Protection and Valent USA, to provide brief analyses of their products' residue dissipation in rice fields over time. Copies of the two papers are attached to this letter. According to Syngenta, molinate has a half-life of approximately five days; by day 28, 98 percent of the applied herbicide has dissipated from the rice field. Valent reports in its paper that thiobencarb has a half-life of 8.7 days; by day 30, less than 1 percent of the initial concentration remains in the field water. Molinate dissipates primarily by photodegradation and thiobencarb primarily by microbial degradation. Based on this data, it does not appear that adding another 7-14 days to these holding periods will result in any significant benefit, while creating adverse impacts in the areas mentioned below. In addition, holding water until June 15 would have different implications for individual fields, depending on when they were planted. If planted June 1, herbicides would have half the time they do now under current holding requirements to dissipate, likely increasing residues in the water.

701 University Ave. Suite 205, Sacramento, CA 95825-6757 • Phone: 916/929-2264 • Fax: 916/929-2553

2. Salinity.

If the holding period were increased, essentially turning fields into static systems, salinity may become a problem, particularly on the west side of the Sacramento Valley which has many fields with saline soils. Yield losses due to salinity are well documented. The primary means of managing salt is to replace field water during the early part of the season when salt is most damaging, therefore extending holds would inhibit this important practice. The additional hold period would further concentrate the salts due to evaporation, serving to amplify an existing problem. Moreover, an extended hold period and the associated changes in water management may result in salinity problems in areas where salinity stress does not exist under current water management guidelines. An area-wide yield reduction would be particularly detrimental to Sacramento Valley communities such as Colusa and Williams where rice is the mainstay of these local economies.

3. Water temperature.

Optimum water temperature for Japonica rice varieties is between 78 and 90 degrees Fahrenheit. A prolonged hold period into the hotter part of the summer could elevate water temperature beyond an optimal range for rice growth. Exceeding that range is not unusual already. A longer exposure window to high water temperatures can significantly impact yields. Additionally, high water temperatures result in more algal growth, which reduces stand vigor. High water temperatures may cause plants to etiolate thereby contributing to lodging and a greater yield loss potential.

4. Weed Control Operations.

Once current hold periods are completed, clean up weed operations occur as necessary. This is when growers apply other herbicides to control weed escapes, often with ground rigs. This is especially important in those areas with resistant weed populations. Watergrass and barnyard grass populations throughout the rice growing regions of California have developed resistance to several herbicides, including molinate and thiobencarb. To manage these resistant populations it is imperative to rotate herbicides with different modes of action. To apply these compounds the water needs to be lowered to expose the weeds. If the hold period were extended beyond the optimal window of time for application of other materials, the growers would not be able to lower the water in a timely manner thereby allowing escaped weeds to reproduce and increase the weed seed bank populations. It is conceivable that an ongoing buildup of weed seeds in the soil could lead to more herbicide applications due to the inability of growers to control escapes in a timely manner. In addition, the rice plants have little time to recover from a period of stress during the initial 28 or 30 day holds before they are stressed once again from the second herbicide application. The consequences on yield and plant vigor are unknown at this time.

5. Hidden costs.

The California rice industry is already strapped with $15 million in additional annual costs for the incorporation of rice straw after harvest as a result of agricultural burning restrictions. These costs do not take into account the potential yield reductions associated with disease buildup over time. We do not know what the hidden (and non-recoverable) costs would be as a result of an extended hold period. Consequences such as investment in new irrigation infrastructure, yield reductions and greater disease incidence would have to be evaluated. To implement a change in the water holding periods without a clear understanding of the economic costs is unwarranted.

6. Additional Measures to be taken by the California Rice Industry in 2002.

The Department of Pesticide Regulation, in its 2001 Rice Pesticides Program Review report, indicates that spray drift is one of the contributing factors to elevated rice pesticide concentrations in surface waters. To address these matters, the California Rice Commission has committed to three additional measures to further improve the program in 2002:

1. The Commission commits to fund the cost of two additional seasonal county surveillance positions to check for spray drift and water spills in areas designated as sensitive due to their proximity to waterways that drain into the Sacramento River.

2. The Commission has asked for and received a commitment from Valent USA to put a voluntary stewardship program into place this spring that focuses on directing the sales of Valent's new, less dusty thiobencarb formulation – Bolero 15G – in areas near sensitive waterways. DPR is currently working on a map indicating the sensitive areas, and this map will be distributed with a "technical bulletin" to Valent's dealers instructing them to direct sales of 15G to these areas.

3. The Commission contracted in November 2001 with a non-profit agricultural education organization, CURES, to develop a rice pesticides spray drift communications outreach program. The program will be presented at the Commission's annual grower meeting on February 14, 2002, and at other grower, pest control advisor and aerial applicator events this spring. An ample supply of the 6-page, color brochure will be made available to all county agricultural commissioner offices, to be distributed to growers with their pesticide use permits.

We hope that DPR and the Regional Water Board will find these additional measures to be satisfactory in further improving an already very successful program.

In conclusion, we believe that extending the present 28-day water holding period for molinate and the 30-day water holding period for thiobencarb would not result in significant

improvement in surface water concentrations and would cause unintended, detrimental and costly consequences in rice field management.

Sincerely,

CALIFORNIA RICE COMMISSION

Kati Buehler

Kati Buehler
Industry Affairs Manager

enclosures

Dissipation of Molinate in Sacramento Valley Rice Fields

Molinate (S-ethyl hexahydro-1H-azepine-1-carbothioate) is a selective herbicide used to control several broad-leaved and grassy weeds including barnyardgrass (Echinochloa sp.) in rice cultures. In California, granular formulations (Ordram 15G) are typically applied by air after the permanent floodwater is established and 7 to 10 days after seeding.

Usage of molinate products in California has averaged around 4 lbs. ai/A/yr. Although it is difficult to accurately ascertain the exact amount of molinate applied per acre per year, the *maximum* seasonal application rate for molinate is 9 lbs. ai/A/yr, whereas the *typical* seasonal application rate ranges from 4 - 7 lbs. ai/A/yr. Some fields will receive a single application (of up to 5 lbs. ai/A) while others may receive up to three applications (totaling up to a maximum of 9 lbs. ai/A/yr).

Currently, after an on-field holding period of 28-days post molinate application (4 - 6 weeks after seeding), the floodwaters are discharged into agricultural drainage canals which flow into tributaries and into the Sacramento River. This managed drainage of the rice fields occurs during late July to August..

Maximum residues of molinate in rice paddy water immediately after application can be estimated using the following equation:

$$\text{mg ai/L in water} = \frac{5 \text{ lbs ai/A} \times 453.6 \text{ g/lb} \times 1000}{1233427 \text{ lb/ft} \times 4\text{"paddy depth} / 12}$$

$$= 5.516 \text{ mg ai/L}$$

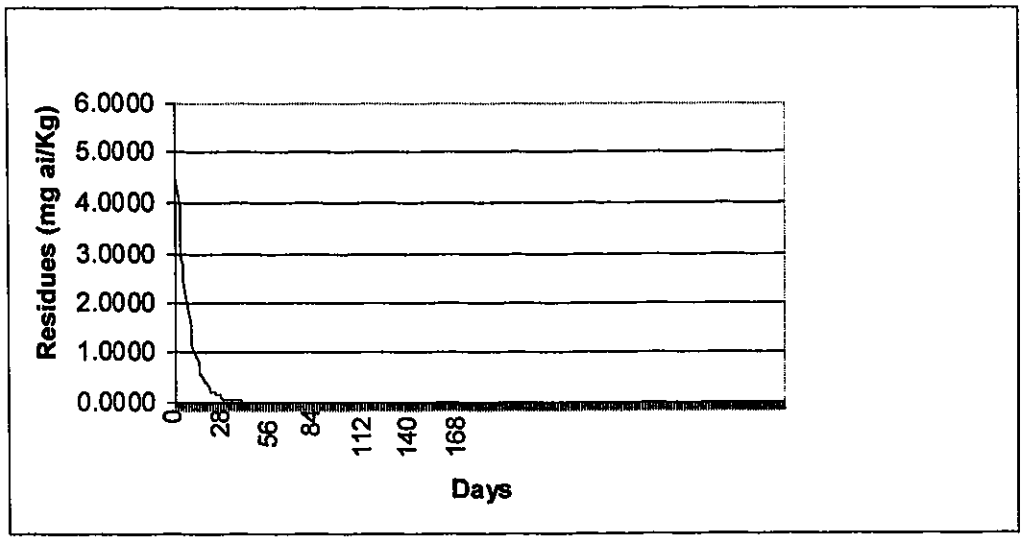
Table 1 provides estimates of the residues of molinate in paddy waters over time. These values are *calculated* using a single-maximum application rate (5 lbs. ai/A) to a 4-inch paddy water depth, using a 5-day paddy water half-life (from field studies), and a first-order exponential decay equation. Under this scenario, the instantaneous maximum concentration for molinate is 5,5160 ug ai/L (Table 1, Day 0).

Table 1. Estimated MaximumTheoretical Molinate Concentrations in Paddy Water over Time.

Day)	Conc (mg/L	Day	Conc (mg/L)	Day	Conc (mg/L)	Day	Conc (mg/L)
0	5.5160	10	1.3790	20	0.3448	30	0.0862
1	4.8020	11	1.2005	21	0. 3001	31	0.0750
2	4.1803	12	1.0451	22	0.2613	32	0.0653
3	3.6392	13	0.9098	23	0.2275	33	0.0569
4	3.1681	14	0.7920	24	0.1980	34	0.0495
5	2.7580	15	0.6895	25	0.1724	35	0.0431
6	2.4010	16	0.6002	26	0.1501	36	0.0375
7	2.0902	17	0.5225	27	0.1306	37	0.0327
8	1.8196	18	0.4549	28	0.1137	38	0.0284
9	1.5841	19	0.3960	29	0.0990	39	0.0248

The following graph reflects the rapid decline of residues with time. By day 28, residues have declined to 114 ug/L.

Figure 1. Dissipation of molinate residues in rice paddies with time.



This rapid , first-order rate of decay with a half-life of approximately 5 days agrees closely with experimental field studies run by a number of trialists including Johnson and Lavy (1995), Ross and Sava (1986), Cornacchia et al (1984), Deuel et al (1978) and Soderquist el al (1977). By Day 28, 98% of the applied residue has dissipated from the rice paddy.

Although residues can theoretically be reduced by increasing the holding times beyond the currently mandated 28-days, this needs to be balanced against the increased potential for the lodging of rice plants and enhancement of algal growth.

References

1. Johnson, W. G. and Lavy, T. L., *Journal of Environmental Quality*, Vol. 24:487-493 (1995)
2. Ross, L. J. and Sava, R. J. *Journal of Environmental Quality*, Vol. 15:220-224 (1986)
3. Soderquist . C. J. et al, *Journal of Ag. Food. Chem*, Vol. 25:940-945 (1977)
4. Deuel, L.E. et al, *Journal of Environmental Quality*, Vol. 7 :373-377(1978)
5. Cornacchia, J. W. et al, Rice Herbicides: Molinate and Thiobencarb. Special Projects Report 84-4sp. California State Water Control Board, Sacramento (1984).

Attachment 3

Syngenta Crop Protection, Inc. Tel 336 632 6000
P.O. Box 18300
Greensboro, NC 27419-8300

syngenta

January 4, 2002

Dr. John Sanders
California Department of Pesticide Regulation
Post Office Box 4015
Sacramento, CA 95825-4015

Dear Dr. Sanders:

Molinate
Dissipation of Molinate in Sacramento Valley Rice Fields

Following a recent CDPR workshop with the Central Valley Regional Water Quality Control Board (CVRWQCB), California Rice Commission, City and County of Sacramento, East Bay Municipal Utility District, Valent and Syngenta Crop Protection, Dennis Kelly (State Government Relations, Syngenta CP) has asked me to send you a brief technical bulletin justifying the current 28-day holding period for the use of molinate in rice.

This document is attached (2 pp.). If you have any questions or need additional guidance, please do not hesitate to contact me at (336) 632-2063.

Sincerely,

James C. Markle

James C. Markle
Health Assessment and Environmental Sciences

0104A5JM (G:CL-Doc/Letters/cb)

Attachment

cc: Kati Buehler (CA Rice Commission)

Dissipation of Molinate in Sacramento Valley Rice Fields

Molinate (S-ethyl hexahydro-1H-azepine-1-carbothioate) is a selective herbicide used to control several broad-leaved and grassy weeds including barnyardgrass (Echinochloa sp.) in rice cultures. In California, granular formulations (Ordram 15G) are typically applied by air after the permanent floodwater is established and 7 to 10 days after seeding.

Although it is difficult to accurately ascertain the exact amount of molinate applied per acre per year, the *maximum* seasonal application rate for molinate is 9 lbs. ai/A/yr, whereas the *typical* seasonal application rate ranges from 4 - 7 lbs. ai/A/yr. Some fields will receive a single application (of up to 5 lbs. ai/A) while others may receive up to three applications (totaling up to a maximum of 9 lbs. ai/A/yr). From the 2000 California Pesticide Reporting Use Survey, there were 1,025,785 lb of molinate applied on 276,310 acres for an average application rate of 3.71 lb ai/A.

Currently, after an on-field holding period of 28-days post molinate application (4 - 6 weeks after seeding), the floodwaters are discharged into agricultural drainage canals which flow into tributaries and into the Sacramento River. This managed drainage of the rice fields occurs during late July to August..

Maximum residues of molinate in rice paddy water immediately after application can be estimated using the following equation:

$$\text{mg ai/L in water} = \frac{5 \text{ lbs ai/A} \times 453.6 \text{ g/lb} \times 1000}{1233427 \text{ lb/ft} \times 4\text{"paddy depth} / 12}$$

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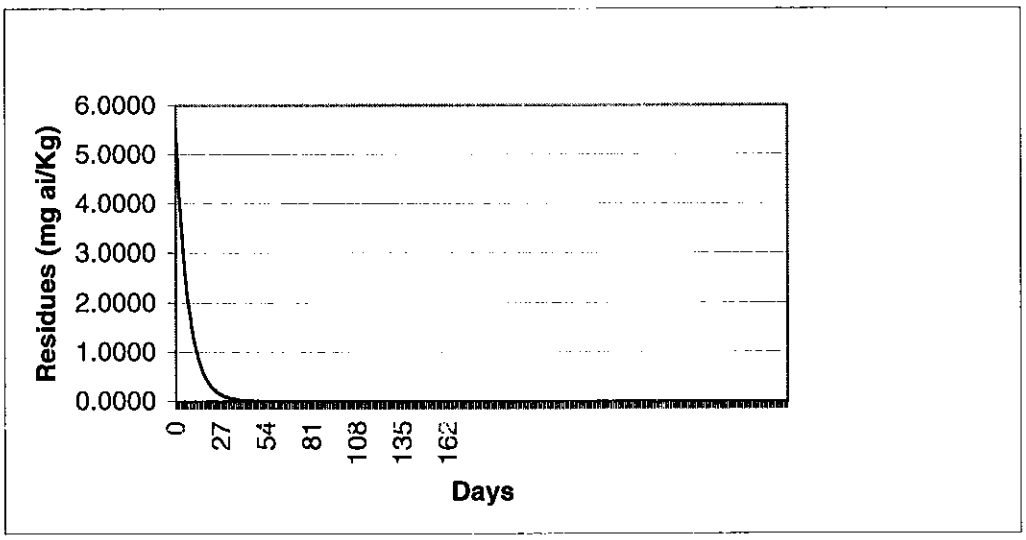
Figure 1. Dissipation of molinate residues in rice paddies with time.



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Although residues can theoretically be reduced by increasing the holding times beyond the currently mandated 28-days, this needs to be balanced against the increased potential for the lodging of rice plants and enhancement of algal growth.

References

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Aitachment 4

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December 31, 2001

Mr. John Sanders
California Department of Pesticide Regulation
1001 I Street
Sacramento, CA 95814

Dear Mr. Sanders:

Following a meeting on December 13, 2001 with DPR, Regional Water Board, City of Sacramento and City of West Sacramento, Ms. Kati Buehler suggested that Valent write you regarding the proposal to extend the water holding period following Bolero use on rice in California.

The present holding period, 30-days following application, is a carefully thought out compromise between the agronomic needs of California rice culture, and the potential for water contamination. It is Valent's position that extending the present holding period will cause considerable disruption in rice field management, without significant improvement in measured water contamination.

From an agronomic viewpoint, extending the present 30-day water-holding period for thiobencarb, the active ingredient in Bolero, has some serious implications for California rice culture. Seedling rice grown in CA flood culture often encounters stress and it is necessary to reduce the depth of the floodwater for the rice to recover or even survive. Stress factors which could make draining necessary include: saline soil (high salt content resulting in "sick" rice -- young rice cannot tolerate high concentrations of salts); calcareous soils (high concentrations of exchangeable Ca) which can cause a zinc deficiency that cannot be tolerated by seedling rice when flooded; build up of toxic gases (carbon dioxide, methane and hydrogen sulfide) and organic acids (lactic, butyric, acetic and propionic) as a result of the submerged decomposition of organic matter (even more important now because of the ban on burning); build up of algae or "scum" which will take the young seedlings below the flood water level; and insect control such as rice water weevil and seed midge. When these conditions occur in rice fields, the grower must take prompt action to save the rice plants. The present 30-day holding period already presents a serious risk to the grower.

Extending the present holding period will not significantly reduce the potential for off field movement of thiobencarb in water. First, thiobencarb binds strongly to soil in the presence of water. Thus only a small proportion of the applied herbicide is in the water phase and is available for off field movement. Secondly, Valent has data on the persistence of thiobencarb in rice field water. The Draft Reregistration Eligibility

Decision document released by EPA (CASE 2665) presents these data in detail. Thiobencarb half-lives in rice field water were 8.7 days in the guideline study (MRID 43404005) ("Aquatic Field Dissipation of Bolero 10 G in Rice" Chevron Chemical Company, Agricultural Chemicals Division, April 1990), and 4.5 days in a study from the scientific literature (Ross and Sava, 1986). A holding period of 30 days, as presently required, represents more than 3 and just less than 7 half-lives. Most of the dissipation of thiobencarb is described by first-order kinetics. That is, after three or seven half lives about 12 or less than 1 per cent of the initial concentration of thiobencarb remains in the field water. It is well known that the decay of agricultural chemicals in water and soil are usually well described by first-order kinetics for the first 3 or 4 half-lives. After much of the chemical has already decayed, the rate often slows. Because the starting concentration of thiobencarb in the field water is relatively low, and because the thirty-day holding period represents at least three half-lives in the field water, extending the holding period is not going to significantly reduce the concentration of thiobencarb in field water available for off field movement.

There is considerable water monitoring data for rice herbicides in the Sacramento River and its rice culture influenced tributaries. Significant concentrations of thiobencarb in the River are usually associated with intense, regional wind or rainfall events. Thiobencarb detections in the River are not usually associated with the time (approximately 30-days after planting) that the first water releases from rice fields are allowed. Thus extending the rice field water holding period will have little practical effect on thiobencarb detections.

While it seems that extending the water holding period in rice culture in California would alleviate a perceived problem of water contamination in the Sacramento River from drainage from rice fields, the situation is more complex. Valent thinks that increasing the holding period would have a detrimental effect on rice culture, without significantly reducing concentrations detected in the River.

Please contact me at (925) 256-2849 if you need more information. Also you may contact Dr. Dave Wustner at (025) 256-2820.

Sincerely,

Doina Bujor
Project Manager, R&RA
Valent U.S.A. Corporation

CC: Kati Buehler, CRC