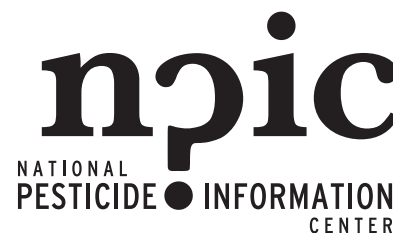


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What is dicamba?

Dicamba is a selective herbicide in the chlorophenoxy family of chemicals. It comes in several salt formulations and an acid formulation. These forms of dicamba have different properties in the environment. Products with dicamba frequently contain other herbicides as well.



photo credit: Erich Westendarp, pixabay

What are some products that contain dicamba?

Products containing dicamba may be liquids, dusts or granules. Products may be concentrated or ready-to-use. Currently, dicamba can be found in over 1100 products that are sold in the United States. It is used in agriculture, residential areas, and other sites.

IMPORANT: Always follow label instructions and take steps to avoid exposure. If any exposures occur, be sure to follow the First Aid instructions on the product label carefully. For additional treatment advice, contact the Poison Control Center at 800-222-1222. If you wish to discuss a pesticide problem, please call 800-858-7378.

How does dicamba work?

Dicamba is similar to the herbicide 2,4-D. Both act like natural plant hormones known as auxins. These hormones help to control plant growth. When plants are treated with dicamba, they grow in abnormal and uncontrollable ways, and often, the plants die. Dicamba is used on many broadleaf weeds and woody plants.

How might I be exposed to dicamba?

Products with dicamba may be used in many places including on home lawns, farms, golf courses and rights-of-way along utility lines, roadsides and railways. You may be exposed if you are applying dicamba and you get it on your skin, inhale it, or eat or smoke afterwards without washing your hands first. You also may be exposed if you touch plants that are still wet with spray. You can limit exposure by following the label carefully if you are using products that contain dicamba. You can also stay away from grass or plants that have been treated until the leaves are dry.

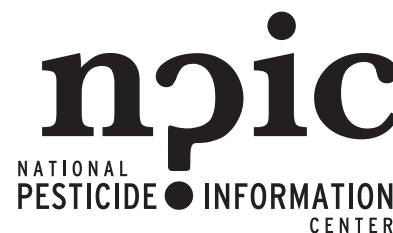
In some cases, dicamba can be found in well water but typically at low levels. These levels are usually so low that no effect on human health is expected. Dicamba has also been found in house dust in farmer's homes at very low levels.

What are some signs and symptoms from a brief exposure to dicamba?

Pure dicamba is low in toxicity if breathed. If inhaled, people may experience dizziness, and irritation of the nose, resulting in coughing. If you get pure dicamba on your skin, it is low in toxicity, however skin irritation may develop. If you get dicamba in your eyes, it is moderately toxic. If dicamba is swallowed,

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people have reported symptoms such as vomiting, loss of appetite and muscle spasms. If a large amount is swallowed, diarrhea and abdominal pain have been reported.

Pets may be exposed to dicamba if they come into contact with plants that have been treated with dicamba, either by eating the plants or walking through an area where dicamba was applied. Signs that a dog or a cat may have been exposed to dicamba include shortness of breath, muscle spasms and the animal may produce a lot of saliva. Birds may also be exposed to dicamba by eating dicamba granules and signs include wing drop, a loss of controlled movements, and weakness.

What happens to dicamba when it enters the body?

In humans, dicamba is not absorbed through the skin very well. If swallowed, dicamba is taken in quickly. Following dicamba's uptake, the chemical is rapidly eliminated in the urine, mostly unchanged. When laboratory rats were fed dicamba, most of the dose was found in urine within two days.

Is dicamba likely to contribute to the development of cancer?

Scientists have not found a clear link between dicamba and cancer in people. One study on pesticide applicators found weak links between lung and colon cancer and dicamba exposure, but other studies have not found any evidence of this. The EPA had concluded that dicamba is not likely to cause cancer in people.

Has anyone studied non-cancer effects from long-term exposure to dicamba?

Scientists have studied the effects from long-term exposure to dicamba to different animals. When rats were fed dicamba for 90 days, some of the rats didn't gain as much weight when compared to rats that were not fed dicamba. When rabbits had dicamba on their skin for 21 days, there were no effects on any internal organs, but dicamba irritated the rabbits' skin.

Are children more sensitive to dicamba than adults?

While children may be especially sensitive to pesticides compared to adults, there are currently no data showing that children have an increased sensitivity specifically to dicamba.

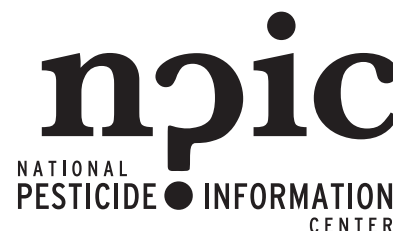
What happens to dicamba in the environment?

When dicamba is applied to plants, it can be absorbed by the leaves and roots. It can travel throughout the plant, but the amount and speed of movement depends on the plant. In water, microbes and ultraviolet (UV) light can break down dicamba.

Dicamba breaks down in soil so that half of the original amount is gone in 30-60 days. Water and microbes in soil can speed up the breakdown of dicamba. Sometimes following an application, dicamba can become airborne and cause damage to nearby plants.

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Can dicamba affect birds, fish, or other wildlife?

The salt forms of dicamba are not likely to hurt birds if eaten. The acid form is slightly or moderately toxic to birds. Dicamba is not likely to harm fish because of its low toxicity. Among several studies in fish exposed to dicamba, results showed that dicamba was relatively non-toxic to fish.

Where can I get more information?

For more detailed information, visit the list of references below, call NPIC at 800-858-7378, or email us at npic@oregonstate.edu. NPIC provides objective, science-based answers to questions about pesticides.

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References:

1. Kamrin, M. A. Phenoxy and benzoic acid herbicides. *Pesticide Profiles: Toxicity, Environmental Impact, and Fate*; CRC Press: Boca Raton, FL, 1997; pp 319-322, 332-334.
2. Reigart, J. R.; Roberts, J. R. *Recognition and Management of Pesticide Poisoning*, 5th ed.; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 1999; pp 94-96.
3. *Correction to the Amendments to the Dicamba RED*; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2009.
4. Tomlin, C. D. S. *The Pesticide Manual, A World Compendium*, 15th ed.; British Crop Protection Council: Surrey, UK, 2009; pp 323-325.
5. Senseman, S. A. *Herbicide Handbook*, 9th ed.; Weed Science Society of America: Lawrence, KS, 2007; pp 336-338.
6. *Database of Hazardous Materials Chemical Datasheet - Dimethylamine Dicamba*; National Oceanic and Atmospheric Administration, Office of Response and Restoration: Silver Spring, MD, 2011.
7. Kelley, K. B.; Riechers, D. E. Recent developments in auxin biology and new opportunities for auxinic herbicide research. *Pestic. Biochem. Physiol.* 2007, 89 (1), 1-11.
8. Caux, P. Y.; Kent, R. A.; Tache, M.; Grande, C.; Fan, G. T.; MacDonald, D. D. Environmental fate and effects of dicamba: a Canadian perspective. *Rev. Environ. Contam. Toxicol.* 1993, 133, 1-58.
9. Bradberry, S. M.; Proudfoot, A. T.; Vale, J. A. Poisoning Due to Chlorophenoxy Herbicides. *Toxicol. Rev.* 2004, 23 (2), 65-73.
10. González, N. V.; Soloneski, S.; Larramendy, M. L. The chlorophenoxy herbicide dicamba and its commercial formulation Banvel® induce genotoxicity and cytotoxicity in Chinese hamster ovary (CHO) cells. *Mutat. Res.* 2007, 634 (1-2), 60-68.
11. Peixoto, F.; Vicente, J. A. F.; Madeira, V. M. C. The herbicide dicamba (2-methoxy-3,6-dichlorobenzoic acid) interacts with mitochondrial bioenergetic functions. *Arch. Toxicol.* 2003, 77 (7), 403-409.

DICAMBA

general fact sheet



12. Edson, E. F.; Sanderson, D. M. Toxicity of the herbicides, 2-methoxy-3,6-dichlorobenzoic acid (dicamba) and 2-methoxy-3,5,6- trichlorobenzoic acid (tricamba). *Food Cosmet. Toxicol.* 1965, 3, 299-304.
13. Gaines, T. B.; Linder, R. E. Acute Toxicity of Pesticides in Adult and Weanling Rats. *Toxicol. Sci.* 1986, 7 (2), 299-308.
14. Yeary, R. A. Miscellaneous Herbicides, Fungicides, and Nematocides. *Small Animal Toxicology*, 2nd ed.; Peterson, M. E.; Talcott, P. A., Eds.; Saunders Elsevier: St. Louis, MO, 2006; p 738.
15. Lorgue, G.; Lechenet, J.; Riviere, A. *Clinical Veterinary Toxicology*; Blackwell Science: Osney Mead, Oxford, 1996; pp 90-91.
16. Beasley, V. R.; Arnold, E. K.; Lovell, R. A.; Parker, A. J. 2,4-D toxicosis. I: A pilot study of 2,4-dichlorophenoxyacetic acid- and dicambainduced myotonia in experimental dogs. *Vet. Hum. Toxicol.* 1991, 33 (5), 435-40.
17. Campbell, S. M.; Grimes, J.; Jaber, M.; Beavers, J. B. An Acute Oral Toxicity study with the Northern Bobwhite. Unpublished Project no. 131-179A, 1993, submitted to U.S. Department of Agriculture, by Sandoz Agro, Des Plaines, IL, prepared by Wildlife International Ltd., Easton MD. EPA MRID No. 42918001. Dicamba - Human Health and Ecological Risk Assessment - Final Report; U.S Department of Agriculture, Forest Health Protection: Arlington, VA, 2004.
18. Dicamba: HED Chapter of the Reregistration Eligibility Decision Document; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
19. Espandiar, P.; Thomas, V. A.; Glauert, H. P.; O'Brien, M.; Noonan, D.; Robertson, L. W. The Herbicide Dicamba (2-Methoxy-3,6- dichlorobenzoic Acid) Is a Peroxisome Proliferator in Rats. *Fundam. Appl. Toxicol.* 1995, 26 (1), 85-90.
20. Dicamba (3,6-dichloro-o-anisic acid); Pesticide Tolerance. *Fed. Reg.* 1999, 64 (3), 759-769.
21. Samanic, C.; Rusiecki, J.; Dosemeci, M.; Hou, L.; Hoppin, J. A.; Sandler, D. P.; Lubin, J.; Blair, A.; Alavanja, M. C. R. Cancer Incidence among Pesticide Applicators Exposed to Dicamba in the Agricultural Health Study. *Environ. Health Perspect.* 2006, 114 (10).
22. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
23. Greenlee, A. R.; Ellis, T. M.; Berg, R. L. Low-Dose Agrochemicals and Lawn-Care Pesticides Induce Developmental Toxicity in Murine Preimplantation Embryos. *Environ. Health Perspect.* 2004, 112 (6).
24. Oehler, D. D.; Ivie, G. W. Metabolic fate of the herbicide dicamba in a lactating cow. *J. Agric. Food Chem.* 1980, 28 (4), 685-689.
25. Tye, R.; Engel, D., Distribution and excretion of dicamba by rats as determined by radiotracer technique. *J. Agr. Food Chem.* 1967, 15 (5), 837-40.
26. Makary, M. H.; Street, J. C.; Sharma, R. P. Pharmacokinetics of dicamba isomers applied dermally to rats. *Pestic. Biochem. Physiol.* 1986, 25 (2), 258-263.
27. Mukherjee, M.; Muraleedharannair, P.; Karmakar, U. K.; Datta, B. K.; Sar, T. K.; Chakraborty, A. K.; Bhattacharya, A.; Choudhury, A.; Mandal, T. K. Toxicokinetics and recovery studies of dicamba dimethyl amine salt in goats following single oral administration. *J. Sci. Food Agric.* 2010, 90 (2), 257-266.
28. Roberts, T. R. *Metabolic Pathways of Agrochemicals Part 1 - Herbicides and Plant Growth Regulators*; The Royal Society of Chemistry: Cambridge, UK, 1998; pp 148-150.
29. Kutz, F. W.; Cook, B. T.; Carter-Pokras, O. D.; Brody, D.; Murphy, R. S. Selected pesticide residues and metabolites in urine from a survey of the U.S. general population. *J. Toxicol. Environ. Health* 1992, 37 (2), 277-91.

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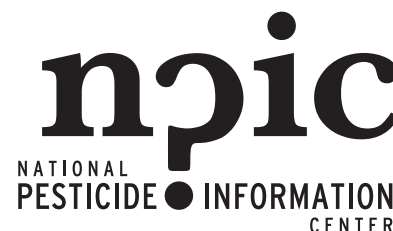
general fact sheet



30. Harris, S. A.; Villeneuve, P. J.; Crawley, C. D.; Mays, J. E.; Yeary, R. A.; Hurto, K. A.; Meeker, J. D. National study of exposure to pesticides among professional applicators: an investigation based on urinary biomarkers. *J. Agric. Food Chem.* 2010, 58, 10253-10261.
31. Altom, J. D.; Stritzke, J. F. Degradation of dicamba, picloram, and four phenoxy herbicides in soils. *Weed Sci.* 1973, 21 (6), 556-60.
32. Krueger, J. P.; Butz, R. G.; Cork, D. J. Aerobic and anaerobic soil metabolism of dicamba. *J. Agric. Food Chem.* 1991, 39 (5), 995-999.
33. Smith, A. E. Breakdown of the herbicide dicamba and its degradation product 3,6-dichlorosalicylic acid in prairie soils. *J. Agric. Food Chem.* 1974, 22 (4), 601-5.
34. Ochsner, T. E.; Stephens, B. M.; Koskinen, W. C.; Kookana, R. S. Sorption of a Hydrophilic Pesticide. *Soil Sci. Soc. Am. J.* 2006, 70 (6), 1991-1997.
35. Scifres, C. J.; Allen, T. J.; Leinweber, C. 35. L.; Pearson, K. H. Dissipation and phytotoxicity of dicamba residues in water. *J. Environ. Qual.* 1973, 2 (2), 306-9.
36. Pesticides in Ground Water Database: A Compilation of Monitoring Studies: 1971-1991 National Summary; U.S Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, U.S. Government Printing Office: Washington, DC, 1991.
37. Kolpin, D. W., Barbash, J. E., Gilliom, R. J. Pesticides in Ground Water of the United States, 1992-1996. *Ground Water* 2000, 38 (6), 858- 863.
38. Behrens, R.; Lueschen, W. E. Dicamba Volatility. *Weed Sci.* 1979, 27 (5), 486-493.
39. Aulagnier, F.; Poissant, L.; Brunet, D.; Beauvais, C.; Pilote, M.; Deblois, C.; Dassylva, N. Pesticides measured in air and precipitation in the Yamaska Basin (Québec): Occurrence and concentrations in 2004. *Sci. Total Environ.* 2008, 394 (2-3), 338-348.
40. Kearney, P. C.; Kaufman, D. D. *Herbicides : chemistry, degradation, and mode of action*, 2nd ed.; Marcel Dekker, Inc.: New York, 1975; pp 563-570.
41. Chang, F. Y.; Born, W. H. V. Dicamba Uptake, Translocation, Metabolism, and Selectivity. *Weed Sci.* 1971, 19 (1), 113-117.
42. Al-Khatib, K.; Parker, R.; Fuerst, E. P. Foliar absorption and translocation of dicamba from aqueous solution and dicamba-treated soil deposits. *Weed Technol.* 1992, 6 (1), 57-61.
43. Lemley, A. T.; Hedge, A.; Obendorf, S. K.; Hong, S.; Kim, J.; Muss, T. M.; Varner, C. J. Selected Pesticide Residues in House Dust from Farmers' Homes in Central New York State, USA. *Bull. Environ. Contam. Toxicol.* 2002, 69 (2), 155-163.
44. Ward, M. H.; Lubin, J.; Giglierano, J.; Colt, J. S.; Wolter, C.; Bekiroglu, N.; Camann, D.; Hartge, P.; Nuckols, J. R. Proximity to Crops and Residential Exposure to Agricultural Herbicides in Iowa. *Environ. Health Perspect.* 2006, 114 (6), 893-897.
45. Pesticide Data Program Annual Summary, Calendar Year 2008; United States Department of Agriculture, Agricultural Marketing Service: Washington, DC, 2009.
46. Pesticide Data Program Annual Summary, Calendar Year 2009; United States Department of Agriculture, Agricultural Marketing Service: Washington, DC, 2011.
47. Total Diet Study Market Baskets 1991-3 through 2003-4; U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Office of Food Safety: College Park, MD, 2004.
48. Fink, R. Eight-day dietary LC50 - Mallard duck. Unpublished Report no. 107-150, 1977, submitted to Council Directive EU Review Programme, by Novartis Crop Protection AG, Basel, Switzerland, prepared by Wildlife

DICAMBA

general fact sheet

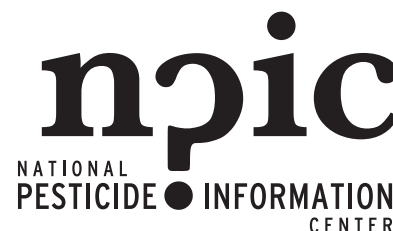


International Ltd., Easton, MD. Dicamba Volume 3 Annex B9: Ecotoxicology Draft Assessment Report; Council Directive EU Review Programme: Denmark, 2007.

49. Campbell, S.; Beavers, J. Technical Dicamba: An Acute Oral Toxicity Study with the Mallard Duck. Unpublished Lab Project no. 131-184A, 1993, submitted to U.S. Environmental Protection Agency, by Wildlife International. Ltd. EPA MRID 42774106. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
50. Touart, L. W. Avian acute oral LD50 Mallard duck. Unpublished Report no. MRID 0046180, 1983, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
51. Gutenson, O. Avian Acute Oral LD50 Bobwhite quail. Unpublished Report no. MRID 261466, 1987, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
52. Avian acute oral LD50 Bobwhite quail. Unpublished Report no. ACC263863, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
53. Rainbow Trout. Dimethylamine salt of dicamba. Unpublished Report no. MRID 00263000, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
54. Woodward, D. F. Acute toxicity of mixtures of range management herbicides to cutthroat trout. J. Range Manage. 1982, 35 (4), 539-40.
55. Touart, L. W. 55. Bluegill sunfish. Dimethylamine salt of dicamba. Unpublished Report no. MRID 00046183, 1983, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
56. Touart, L. W. Rainbow trout. Sodium salt of dicamba. Unpublished Report no. MRID 00029623, 1983, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
57. Touart, L. W. Bluegill sunfish. Sodium salt of dicamba. Unpublished Report no. MRID 00022539, 1983, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
58. Acute toxicity of potassium salt of dicamba to Bluegill Sunfish. Unpublished Report no. MRID 258983, 1985, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
59. Bond, C. E.; Fortune, J. D.; Young, F. Results of Preliminary Bioassays with Kurosai SL and Dicamba. The Progressive Fish-Culturist 1965, 27 (1), 49-51.

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60. Daphnia. Dimethylamine salt of dicamba. Unpublished Report no. MRID 00028283, 1983, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
61. Daphnia. Sodium salt of dicamba. Unpublished Report no. MRID 00233292, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
62. Aquatic Invertebrate Acute Toxicity. Daphnia magna. Unpublished Report no. MRID ACC263863, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
63. Zucker, E. Banvel CN-10-6471 Potassium Formulation. Acute Toxicity of CN-10-6471 to Daphnia magna. Unpublished Report no. MRID 258983, 1985, submitted to the U.S. Environmental Protection Agency. EFED Reregistration Chapter For Dicamba/Dicamba Salts; U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, U.S. Government Printing Office: Washington, DC, 2005.
64. Sanders, H. O. Toxicities of Some Herbicides to Six Species of Freshwater Crustaceans. J. Water Pollut. Control Fed. 1970, 42 (8), 1544- 1550.
65. Johnson, C. R. Herbicide toxicities in some Australian anurans and the effect of subacute dosages on temperature tolerance. J. Linn. Soc. London, Zool. 1976, 59 (1), 79-83.
66. Cullimore, D. R. The in vitro sensitivity of some species of Chlorophyceae to a selected range of herbicides. Weed Res. 1975, 15 (6), 401-406.
67. Design for the Environment Program Alternatives Assessment Criteria for Hazard Evaluation; U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, U.S. Government Printing Office: Washington, DC, 2010; p 26.
68. Morton, H. L.; Moffett, J. O.; Macdonald, R. H. Toxicity of Herbicides to Newly Emerged Honey Bees. Environ. Entomol. 1972, 1, 102-104.
69. Effect of 3,6-Dichloro-2methoxybenzoic acid on Apis mellifera Mortality; U.S. Environmental Protection Agency, Office of Prevention, Pesticides, and Toxic Substances, Office of Pesticide Programs, Environmental Fate and Effects Division, U.S. Government Printing Office: Washington, DC, 2000.
70. Stevenson, J. H. The Acute Toxicity of Unformulated Pesticides to Worker Honey Bees (Apis mellifera L.). Plant Pathol. 1978, 27 (1), 38-40.
71. 2011 Edition of the Drinking Water Standards and Health Advisories; EPA 820-R-11-002; U.S. Environmental Protection Agency, Office of Water, U.S. Government Printing Office: Washington, DC, 2011.
72. WHO. Acceptable daily intakes, acute reference doses, short-term and long-term dietary intakes, recommended maximum residue limits and supervised trials median residue values recorded by the 2010 meeting; World Health Organization, Food and Agriculture Organization of the United Nations: Rome, Italy, 2010.

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