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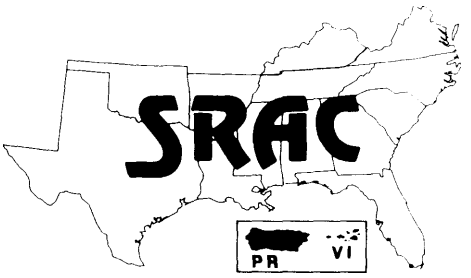

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Calculating Treatments for Ponds and Tanks

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Every fish farmer has to occasionally use chemical treatments to remove fish, alter water quality, cure disease and control aquatic vegetation. The fish farmer must follow treatment directions carefully, know the proper amount or concentration of chemical to use and know the pond area and/or volume. For information on calculating area and volume request SRAC No. 103 -*Calculating Area and Volume of Ponds and Tanks.*

Regulation and/or approval of chemicals for aquatic use is confusing to fish farmers and fisheries professionals, alike. Aquatic chemicals are regulated federally by the Environmental Protection Agency (EPA) and the Food and Drug Administration (FDA). An oversimplified statement of their missions would be that the EPA regulates chemicals applied to water while FDA regulates chemicals applied to fish.

The fact that approved chemicals can be used only for purposes stated on the label (including the specific target species) is commonly misunderstood. Chemicals approved for water treatment cannot be used for therapeutic purposes nor can a therapeutant approved for one species, e.g., catfish, be used on another, e.g., hybrid striped bass. The above is true even of chemicals given GRAS (Generally Recognized As Safe) status. The FDA and/or EPA can approve treatments using unregistered chemicals on a case-by-case basis. For information on special approval contact the appropriate federal agency.

Several chemicals commonly used in fish culture have never been properly registered. Many chemicals will soon be reviewed and either approved or barred for specific uses. Check with your county Extension office or fisheries specialist for recent developments on approved fisheries chemicals.

If aquaculture products are to be perceived as wholesome and safe by the consumer, all producers and processors must guard against the misuse of or contamination from unapproved chemicals.

Precautions when making chemical treatments

Chemicals can react quite differently in water depending on its quality and on the target species. For example, less copper sulfate should be used in water of low alkalinity than in water of high alkalinity. And to be effective, more potassium permanganate is needed as organic content increases.

Furthermore, fish already weakened by stress or disease may succumb to even a "normal" chemical dose. To avoid overdosing fish with a chemical, a simple "bioassay" should be conducted. In a bioassay a small sample of fish from the pond is treated, in the pond's water, with the proposed chemical dosage to determine its safety and effectiveness (see bioassay section).

Check oxygen concentrations carefully and be prepared to aerate after chemical treatments, particularly after using potassium permanganate, copper sulfate or formalin.

Use accurate, sensitive scales to weigh chemicals when treating small volumes of water such as the amounts in hauling or holding tanks, hatching troughs and cages. If a suitable scale is not available, commonly available measuring spoons and cups can be used. Cups and spoons are not the best way to measure chemicals, but are better than using inaccurate scales or "eyeballing" the dosage. Accurate spoon and cup measures must be used. Purchase only utensils labeled "U.S. Standard Measure"

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or ask a pharmacist to check the volumes of your measuring devices with his accurate measures. **Inaccurate chemical measurements can harm or kill fish or fail to do the intended job.**

Using the tables

The following tables of chemical treatments explain how each chemical can be used and give the amounts to use in various water volumes. Some tables give varying doses used under different water quality conditions. Chemicals differ in density, so a teaspoon of one chemical may not be equal in weight to a teaspoon of another chemical. If necessary, use the Measurement Conversion Tables to convert volume measurements to weights of specific chemicals.

To use the tables, lookup the chemical which will solve or control your problem; check all the tables to know your options. Check for the correct concentration in the left-hand column in Tables 1 through 7, and the headnote in Tables 8 and 9. Then choose the chemical treatment you prefer and use the application rates in that table.

Concentrations or treatment rates are usually expressed in parts per million (ppm). One ppm refers to the addition of 1 part of chemical in 999,999 parts of water (by weight), For example, 1 pound of potassium permanganate dissolved in 999,999 pounds of water gives a concentration of 1 ppm.

An acre-foot is a unit of volume having an area of 1 acre and a depth of 1 foot. Acre-feet are calculated by multiplying the pond area in acres by the average depth in feet.

A cubic foot is a unit of volume calculated by multiplying length times width times depth, all measured in feet.

For example, if you want to treat brood fish before stocking, you may wish to use table-grade salt. In Table 3 you find that 30,000 parts per million (ppm) salt could be used before stocking. The column under "Volume of water to which salt is added" in Table 3 provides the amount of chemical to use in differing volumes of water. Volumes of water are measured in gallons, cubic feet and acre-feet. Following the above example, 5 cups, or 2.5 pounds (lb), or 1,140 grams (g) are mixed into 10 gallons of water to make the 30,000 ppm salt solution used for treating brood fish. The fish would be dipped into this solution for 15 seconds before stocking into a pond.

Three treatment durations are described in the tables. They are dip, **prolonged** and indefinite. Dip treatments last from a few seconds to a few minutes, then fish are moved into fresh or clean water. Prolonged treatments, sometimes referred to as baths or flush treatments, are also short, lasting several minutes to hours. After a prolonged treatment fish can be removed to clean water, or clean water can be flushed rapidly through the holding container. Indefinite treatments have no set length of time or time limit. Fish can be left in indefinite treatments.

Min and Max designations provide the range for effective treatment rates. Min refers to the minimum amount of chemical that should be used, and Max refers to the maximum. Using less than the minimum or more than the maximum amount could result in ineffective treatments or overdoses resulting in fish kills.

Tables 8 and 9 are arranged differently from the other tables because treatment rates using copper sulfate vary with alkalinity.

Conducting a simple bioassay

A simple on-site test can be done to determine if an approved chemical could be toxic under specific pond conditions. The test should be run using both fish and water from the pond to be treated. The test exposes a few fish to the concentration of the proposed chemical treatment while other fish are confined in the same type of environment as the fish in the treatment, but without any chemical exposure (called a control). Tests can be done in plastic buckets, aquaria, or in plastic bags suspended in the pond. Dissolved oxygen and other water quality conditions must be maintained as closely as is practical to that of the pond. Aeration and water replacement (before the test is started) may be required to maintain water quality.

Do not overcrowd the fish in the treatment containers. A safe level of crowding would be to keep fish weight at or below one thousandth of the weight of the water used in the test (i.e., 1 pound of fish to 1,000 pounds of water). Tests should be run in duplicate or triplicate so that a chance error or mistake will not be misinterpreted. It is best to observe the fish in the test containers for at least one day before treatment to reduce the chance of deaths caused by handling. The test should be run for 24 to 96 hours. If the chemical is known to detoxify in 24 hours or less, the test can be concluded after 24 hours. If the toxicity of the chemical is unknown, it's best to run the test for 96 hours. Follow the basic procedure described below to conduct a bioassay.

1. Place fish (minimum of 10) in each container. Use at least two containers for the treatment and two for controls.
2. Observe for at least 24 hours.
3. Add chemical at desired concentration to the test containers; add nothing to the control containers.
4. Observe for 24 to 96 hours. Record mortalities.

If fish are still alive after the test it should then be safe to treat the pond. If some fish die, you must decide if some mortalities are acceptable. Chemical treatments may kill fish that are already severely stressed.

The above procedure can also be used to determine when it is safe to restock fish after a rotenone chlorine, or hydrated lime treatment.

Herbicide treatments (with the exception of copper sulfate) have been excluded from this publication. For information on herbicide treatments refer to SRAC publications No. 360 *Aquatic Weed Management - Control Methods* and No. 361 *Aquatic Weed Management - Herbicides.*

Table 1. POTASSIUM PERMANGANATE ($KMn0_4$). Approved (exempted from registration by EPA) for use in food fish ponds as an oxidizing and detoxifying agent. Potassium permanganate has been used experimentally to control external bacteria and parasites (e.g., *Costia, Trichodina, Ambiphrya, Chilodonella,* and gill flukes). Treatment concentrations for $KMnO_4$ are at 2 ppm for various volumes of water. Potassium permanganate in concentrations greater than 2 ppm can be toxic to fish if the organic content of the water is low. Usually 2 ppm $KMn0_4$ is an effective treatment, but if the color of the water changes from red to yellow-brown in less than 12 hours, the $KMn0_4$ has broken down too quickly. If this occurs treat immediately with an additional 2 ppm. Level all spoon and cup measurements. Dissolve in water and spread chemical evenly over the water surface. Potassium permanganate can kill algae, which can lead to an oxygen depletion, so be prepared to aerate after using it as a pond treatment. Use extreme care to prevent contact with skin or eyes,

Concentration and duration of treatment		Volume of water to which $KMn0_4$ is added				
		500 gal	1,000 gal	100 ft^3	1,000 ft^3	1 acre-foot
Weights and volumes in the columns to the right are calculated at 2 ppm for indefinite treatments	g	3 . 8	7.6	5.7	5 6 . 6	-
	kg	-				2.45
	lb	-				5.4
	tsp	1/2	1	3/4*	7	
	cups	-				6 1/3

*3/4 = 1/2 + 1/4

Table 2. ACETIC ACID (Vinegar). Approved (FDA-GRAS declaration) for use on food fish as a parasiticide. Commercial or food grade vinegar is used at 1,000 to 2,000 ppm as a dip for 1 to 10 minutes. Dip treatments are usually performed in buckets, aquaria, or small tanks. Ounces in the table refer to weight, **NOT FLUID OUNCES.** Cup and tablespoon measures are approximate and slightly underestimate concentration. Watch fish closely, **remove** fish from dip and place in clean water at signs of stress.

Concentration and duration of treatment		Volume of water to which vinegar is added									
		5 gal		10 gal		50 gal		100 gal		1,000 gal	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1,000 to 2,000 ppm as a dip (1 to 10 minutes)	g	19	38	38	76	190	380	380	760	3,800	7,600
	kg	-	-	-	-	-	-	0.38	0.76	3.8	7.6
	oz	0.67	1.34	1.34	2.68	6.7	13.4	13.4	26.8	26.8	53.6
	Tbsp	-	2 1/2*	2 1/2	5	-	-		-	-	-
	cups	-	-	-	-	3/4*	1 1/2	1 1/2	3 1/8*	15 3/4	31 2/3

*2 1/2 = 2 Tbsp + 1 1/2 tsp 3/4 = 1/2 + 1/4 3 1/8 = 3 + 2 Tbsp

Table 3. SALT (NaCl-Sodium Chloride). Coarse-grain, meat-curing grade is given with volumes for common table salt in parentheses ( ). Approved (FDA-GRAS declaration) for use on food fish as an osmoregulatory enhancer. Salt by its osmoregulatory action causes fish to release large amounts of mucus from their skin and gills. The release of mucus removes and/or kills (at high salt concentrations) some external parasites on the fish. At low concentrations salt reduces osmotic stress during handling, holding and hauling. Ounces in the table refer to weight, **NOT FLUID OUNCES.** Level all spoon and cup measurements.

Concentration and duration of treatment		Volume of water to which salt is added							
		10 gal		100 gal		10 ft^3		100 ft^3	
30,000 ppm or 3% as a quick dip (15 to 60 seconds) before stocking	g	1,140		11,400					
	kg	1.14		11.4					
	lb	2 1/2		25					
	cups	5 (3 2/3)		50 (36 2/3)					
		Min	Max	Min	Max	Min	Max	Min	Max
10,000-30,000 ppm as a prolonged treatment (30 minutes or until the fish show signs of stress)	g	380	1,140	3,800	11,400	-			
	kg	0.38	1.14	3.8	11.4	2.83	8.49	28.3	84.9
	lb	3/4	2 1/2	8 1/3	25	6 1/4	18 3/4	62 2/5	187 1/5
	cups	1 2/3 (1 1/4)	5 (3 2 / 3)		- -	- -	- -	- -	- -
1,000-2,000 ppm (0.1 to 0.2%) in hauling tanks as an indefinite treatment	g	38	76	380	760	283	566	-	-
	kg	-	-		-		-	2.8	5.6
	lb	-	-	4/5	1 2/3	2/3	1 1/4	-	-
	Tbsp	2 2/3 (2)	5 1/4 (4)	- -	- -	- -	- -	- -	- -
	cups			1 2/3 (1 1/4)	3 1/3 (2 1/2)	1 1/4 (1)	2 1/2 (1 3/4)	-	-
200-500 ppm as an indefinite treatment to relieve stress	g	7.6	19	76	190	56.6	141.5	-	-
	kg	-	-	-	-	-	-	0.57	1.4
	oz	-	-	2 2/3	6 2/3	2	5	20	50
	tsp	1 1/2 (1 1/8)	4 (3)	- -	- -	- -	- -	- -	- -
	Tbsp	- -	- -	5 1/4 (4)	13 1/4 (9 3/4)	4 (3)	9 3/4 (7 1/4)	- -	- -
	cups	-	-	-	-	-	-	2 1/2 (1 3/4)	6 (4 1/4)

Table 4. HYDRATED and SLAKED LIME. Hydrated lime (calcium hydroxide) and slaked lime (calcium oxide) are approved (by FDA-GRAS and EPA) as pond sterilants. Pond should be drained before lime is added. Lime should be spread evenly across the pond bottom and allowed to react with the mud. These compounds can cause severe chemical burns. Care should be taken during application that the lime does not come in contact with skin or eyes. Application rates in parentheses ( ) are for slaked lime.

Duration of treatment		Area of pond to which lime is added					
		1/4 acre		1/2 acre		1 acre	
		Min	Max	Min	Max	Min	Max
Two days or longer at 1,500 to 2,000 lb per acre (of bottom)	kg	170 (227)	226.8 (302)	340.1 (454)	453/5 (605)	680.3 (907)	907 (1 ,210)
	lb	375 (500)	500 (667)	750 (1,000)	1,000 (1,333)	1,500 (2,000)	2,000 (2,667)

Table 5. HTH Dry (Calcium hypochlorite). HTH or powdered calcium hypochlorite (swimming pool grade - 65% chlorine) is approved (EPA) for use in food fish ponds as a disinfectant and sanitizer to control algae or kill bacteria Fish are removed before treatment. HTH at 200 ppm available chlorine is used to sanitize tanks, raceways and utensils. HTH at 5 to 10 ppm residual chloride is used to control algae and bacteria in ponds. Residual chloride concentrations in pond water must be tested and maintained - dose rate in the table is for initial dose of 10 ppm.

Concentration and duration of treatment		Volume of water to which HTH is added				
		10 gal	100 gal	1,000 gal	100 ft^3	1 acre-foot
200 ppm available chlorine for 1 hour	g	11.7	116.9	1,169.2	870.8	
	kg	-	0.12	1.17	0.87	381.5
	oz	0.41	4.11	41.1	30.7	
	lb	-	-	2.6	1.9	834
	tsp	2 1/4		-		-
	Tbsp	-	7 2/3*			-
	cups	-	-	4 7/8*	3 5/8*	-
		1,000 gal	100 ft^3		1 acre foot	
10 ppm dose -5 to 10 ppm residual chlorine needs to be maintained for 12 to 24 hours	g	58.5	43.5		.	
	kg	-			19.1	
	lb	-			42.1	
	Tbsp	4	3		-	
	cups	1/4			-	

*7 2/3 Tbsp = 7 Tbsp + 2 tsp
4 7/8 Cups = 4 Cups + 1/2 Cup + 1/4 Cup + 2 Tbsp
3 5/8 Cups = 3 Cups + 1/2 Cup + 2 Tbsp

Table 6. PARACIDE-F (formalin). Consists of 37-40% formaldehyde by weight. Formalin is considered 100 percent active. It is approved (FDA) as a paracide for use on trout, salmon, catfish, largemouth bass and bluegill. Paracide-F is also approved for use as a fungicide on trout, salmon and esocid eggs. Paraformaldehyde is a toxic derivative of formalin. Paraformaldehyde has a milky-white appearance and forms if the formalin is too old or if it is exposed to temperatures lower than 40°F. Ounces in the table refer to weight, NOT FLUID OUNCES. Each 5 ppm formalin added to the water removes 1 ppm oxygen. **Avoid** its use when dissolved oxygen is low, or be prepared to aerate. Never leave the 1-hour treatment unattended. Flush the formalin from the water if the fish show signs of stress before 1 hour is up, If water temperature is greater than 70°F, do not treat with more than 167 ppm formalin. Eggs should not be treated when they are within 24 hours of hatching because they tend to concentrate the chemical inside their shells at this stage of development, resulting in death.

Concentration and duration of treatment		to which PARACIDE-F is added									
		100 gal		1,000 gal		50 $feet^3$		100 $feet^3$		1 acre-foot	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
125-250 ppm as a prolonged treatment	g	47.5	95	475	950	176.9	353.8	353.8	707.6		
	oz	1 2/3	3 1/3	16.75	33.5	6 1/4	12 1/2	12 1/2	25		
	Tbsp	3	6	-	-	-	-	-	-		
	cups			3 3/4*	-	1 1/2	-	2 3/4*	-		
15-25 ppm as an indefinite treatment	g	5.7	9.5	57	95	21.2	35.4	42.4	70.8	-	-
	kg	-	-	-	-	-	-	-	-	18.5	30.8
	oz	-	-	2	3 1/3	3/4	1 1/4	1 1/2	2 1/2	-	-
	lb	-	-	-	-	-	-	-	-	40 4/5	68
	tsp	1	1 3/4*	10	17 1/2	4	6 3/4*	8	13 3/8*	-	-
	Tbsp	-	-	3 1/2	6	1 1/3*	2 1/4*	2 3/4	4 1/2	-	-

* 1 3/4 = 1 + 1/2 + 1/4
6 3/4 = 6 + 1/2+ 1/4
13 3/8 = 13+ 1/4 + 1/8
3 3/4 = 3 + 1/2+ 1/4

2 3/4 = 2 + 1/2 + 1/4
1 1/3 Tbsp = 1 Tbsp + 1 tsp
2 1/4 Tbsp = 2 Tbsp + 1/2 tsp + 1/4 tsp
2 3/4 Tbsp = 2 Tbsp + 2 tsp + 1/4 tsp

Table 7. ROTENONE. Rotenone (5%) is an approved nonfood fish toxicant. Rotenone (5%) is applied at 0.5 to 5 ppm for removing unwanted fish from ponds before restocking. Rotenone is most effective at water temperatures above 70°F. Rotenone comes in both liquid and powdered formulations. Liquid rotenone should be diluted in 5 parts of water. Powdered rotenone should be mixed with water to form a slurry and then diluted in 5 parts of water. Apply rotenone evenly across the surface of the pond and into deep areas (below stratification) of the pond if the pond is stratified. Fish can usually be restocked one to four weeks after application, depending on water temperature (see bioassay section for testing procedure).

Concentration		Volume of water to which rotenone is added					
		100 ft^3		1,000 ft^3		1 acre-foot	
		Min	Max	Min	Max	Min	Max
0.5 to 5 ppm	g	1.4	14.15	14.15	28.3	614.6	6,146.3
	kg	-	-	-	-	0.61	6.1
	oz	0.05	0.5	0.5	1.0	21.7	216.8
	lb	-	-	-	-	1.36	13.6
(liquid only)	gal	-	-	-	-	0.16	1.63

Table 8. COPPER SULFATE ($CuSO_4$). Copper sulfate is an approved algicide for use in food fish ponds. Experimentally copper sulfate has been used to treat fish parasites such as: *Ichthyophthirius* (Ich), *Trichodina, Icthyobodo* (Costia), *Trichophrya, Chilodonella, Ambiphrya* (Scyphidia), *Apisoma* (Glossatella) and fungus. Copper sulfate is available in two forms, snow (crystals) and powder. Either can be used for treatment purposes, but care must be taken when using volumetric (cup and spoon) measures. The following table lists measures for snow. Volumetric measures for powder are listed in Table 9. Pond volume measurements should be accurate, because the rate to kill algae is only slightly less than the rate that will kill fish. Copper sulfate is generally used as an indefinite pond treatment. Dosages vary with total alkalinity of the water. **DO NOT USE COPPER SULFATE WHEN TOTAL ALKALINITY IS LESS THAN 20 ppm**. At specific total alkalinities, the dosage level is roughly the same, whether used as a herbicide to kill algae or as an experimental disease treatment. Repeated treatments may be necessary. Before treatment measure the total alkalinity of your water and find the corresponding dosage in the table. Dissolve the necessary amount of copper sulfate in a container of water and distribute it evenly over the pond. Copper sulfate kills algae, which may cause an oxygen depletion, so be prepared to aerate after treatment. Ounces in the table refer to weight, **NOT FLUID OUNCES**. Level all spoon and cup measurements.

$CuSO_4$ (ppm) concentration	Total alkalinity							
	20-49 ppm		50-99 ppm		100-149 ppm		150-200 ppm	
	Min 0.25	Max 0.5	Min 0.5	Max 0.75	Min 0.75	Max 1.0	Min 1.0	Max 2.0
Pounds (lb) per acre-foot	3/5	1 1/3	1 1/3	2	2	2 3/4	2 3/4	5 1/2
Grams (g) per acre-foot	308	616	616	924	924	1,234	1,234	2,470
Ounces (oz) per acre-foot	11	21 3/4	21 3/4	32 2/3	32 2/3	43 1/2	43 1/2	87
Level cups per acre-foot	1	2	2	3	3	4	4	8
Grams (g) per 1,000 gal	0.95	1.90	1.90	2.85	2.85	3.80	3.80	7.60
Level teaspoons per 1,000 gal	1/8	1/4	1/4	1/2	1/2	5/8*	5/8*	1 1/4
Grams (g) per 10,000 gal	9.5	19.0	19.0	28.5	28.5	38.0	38.0	76.0
Level spoons per 10,000 gal	1 1/2 tsp	3 tsp	3 tsp	4 1/2 tsp	4 1/2 tsp	2 Tbsp	2 Tbsp	4 Tbsp
Grams (g) per 1,000 ft^3	7.1	14.1	14.1	21.2	21.2	28.3	28.3	56.6
Level spoons per 1,000 ft^3	1 1/8 tsp	2 1/4 tsp	2 1/4 tsp	3 1/4 tsp	3 1/4 tsp	4 1/2 tsp	4 1/2 tsp	3 Tbsp

* 5/8 = 1/2 + 1/8

Table 9. Volumetric measures for COPPER SULFATE POWDER. Do not use this table for copper sulfate snow or crystals, or the risk of overdose and fish mortality may result (See Table 8 for warnings).

$CuSO_4$ (ppm) concentration	Total alkalinity							
	20-49 ppm		50-99 ppm		100-149 ppm		150-200 ppm	
	Min 0.25	Max 0.5	Min 0.5	Max 0.75	Min 0.75	Max 1.0	Min 1.0	Max 2.0
Level cups per acre-foot	1 2/3*	3 1/4	3 1/4	4 3/4	4 3/4	6 1/2	6 1/2	12 3/4
Level teaspoons per 1,000 gal	1/4	1/2	1/2	3/4	3/4	1	1	2
Level spoons per 10,000 gallons	2 3/8* tsp	4 3/4 tsp	4 3/4 tsp	2 1/3* Tbsp	2 1/3* Tbsp	3 1/8* Tbsp	3 1/8* Tbsp	6 1/3* Tbsp
Level spoons per 1,000 cubic feet	1 3/4 tsp	3 1/2 tsp	3 1/2 tsp	5 1/4 tsp	5 1/4 tsp	2 1/3* Tbsp	2 1/3* Tbsp	4 3/4* Tbsp

*1 2/3 = 1 + 1/3 + 1/3
4 3/4 = 4 + 1/2 + 1/4
2 3/8 = 2 + 1/4 + 1/8

2 1/3 Tbsp = 2 Tbsp + 1 tsp
3 1/8 Tbsp = 3 Tbsp + 1/2 tsp
6 1/3 Tbsp = 6 Tbsp + 1 tsp
4 3/4 Tbsp = 4 Tbsp + 2 1/4 tsp

MEASUREMENT CONVERSION TABLES

Table 10. Weight in grams for spoon and cup volumes of common chemicals used in treatment.

All Volumetric Measurements are for Level Tsp, Tbsp and Cups

Copper Sulfate ($CuSO_4$) Snow
- 1/4 tsp = 1.6 g
- 1/2 tsp = 3.2 g
- 1 tsp = 6.4 g
- 1 Tbsp = 19.2 g
- 1/4 cup = 76.8 g
- 1/2 cup = 153.6 g
- 1 cup = 307.2 g

Copper Sulfate ($CuSO_4$) Powder
- 1/4 tsp = 1 g
- 1/2 tsp = 2 g
- 1 tsp = 4 g
- 1 Tbsp = 12 g
- 1/4 cup = 48 g
- 1/2 cup = 96 g
- 1 cup = 192 g

Paracide-F (37% Formaldehyde)
- 1/4 tsp = 1.3 g
- 1/2 tsp = 2.6 g
- 1 tsp = 5.3 g
- 1 Tbsp = 15.8 g
- 1/4 cup = 63.2 g
- 1/2 cup = 126.4 g
- 1 cup = 252.8 g

Potassium Permanganate ($KMnO_4$)
- 1/4 tsp = 2 g
- 1/2 tsp = 4 g
- 1 tsp = 8 g
- 1 Tbsp = 24 g
- 1/4 cup = 96 g
- 1/2 cup = 192 g
- 1 cup = 384 g

Coarse-Grain Salt (NaCl)
- 1/4 tsp = 1.2 g
- 1/2 tsp = 2.4 g
- 1 tsp = 4.8 g
- 1 Tbsp = 14.4 g
- 1/4 cup = 57.6 g
- 1/2 cup = 115.2 g
- 1 cup = 230.4 g

Table Salt (NaCl)
- 1/4 tsp = 1.6 g
- 1/2 tsp = 3.3 g
- 1 tsp = 6.5 g
- 1 Tbsp = 19.5 g
- 1/4 cup = 78 g
- 1/2 cup = 156 g
- 1 cup = 312 g

Vinegar
- 1/4 tsp = 1.2 g
- 1/2 tsp = 2.5 g
- 1 tsp = 5.0 g
- 1 Tbsp = 15.0 g
- 1/4 cup = 60 g
- 1/2 cup = 120 g
- 1 cup = 240 g

HTH (65% Chlorine)
- 1/4 tsp =1.25 g
- 1/2 tsp = 2.5 g
- 1 tsp = 5.0 g
- 1 Tbsp = 15.0 g
- 1/4 cup = 60 g
- 1/2 cup = 120 g
- 1 cup = 240 g

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