



**As used
WORLDWIDE**

GUIDE TO SOLVITA® TESTING FOR COMPOST MATURITY INDEX

The Solvita® procedure is a widely recognized and simple test that gives a Maturity Index for active or aged compost. The kit measures the carbon-dioxide respiration and ammonia volatility simultaneously in the same test. Each of these traits alone provide important clues to compost quality, and used together will accurately estimate the general condition and safety of any composted product.

Compost Maturity is a term that is used in a variety of ways. The Solvita Maturity Test ranks your compost on a 1-to-8 index scale of increasing maturity. Maturity in this sense means *resistant to further decomposition and free of compounds such as ammonia and organic acids which can be toxic to plant growth.*

The Solvita test can be used effectively for the following purposes:

- 1) To comply with state, governmental or trade standards that specify stability/maturity.¹
- 2) For evaluating compost conditions in order to make improvements to the process;
- 3) To determine the best end-use prior to distribution and sales.

3 Steps to Satisfactory Test Results

There are three easy steps involved in using the Solvita test kit to evaluate compost.

- A- Carefully obtain and prepare the sample.
- B- Perform the test by placing both Solvita gel-paddles in the jar. Use enclosed Color Keys to find the appropriate color numbers. Use the simple computation table to determine your compost's Maturity Index.
- C- Interpret the results. Once you know the maturity index, consider the process management and desired end use of your compost. Use the tables in the manual as well as the troubleshooting section to evaluate the process and determine the best use.

QUALITY CONTROL & STORAGE OF SOLVITA KITS

All Solvita kits are carefully packaged at the factory to insure highest quality prior to shipping. The gel-paddles should be the "Control Color" when the foil pack is opened (see color chart). If the foil packs have been damaged, or the jar cracked, then the test may not work properly. From the date of purchase the kits may be used for up to one year. Shelf-life is significantly extended by refrigerating the foil packs. Do not allow to freeze.

1. Solvita is approved or required in the USA: CA, CT, ID, IL, KS, OH, MA, ME, MN, NJ, NM, TX, WA and in Europe for: DK, S, N, UK, It, and for the EC Eco-Label Program.

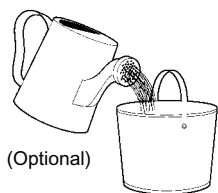
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SAMPLE PREPARATION

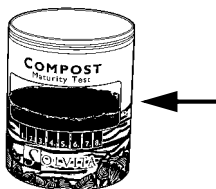
1. **COMPOSITE SAMPLE:** Make a composite sample by combining at least 10 sub-samples that fairly represent the whole compost pile or batch. Mix thoroughly in a clean pail, then discard all but about 1 quart (1 liter) of product.



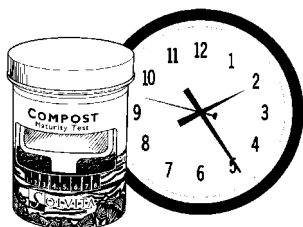
2. **SCREENING:** If you are testing compost that will be screened before sale or use, then screen the sample similarly before running the test. It is advisable to remove stones and very large stems and woods chips that may interfere with the test.



3. **CHECK MOISTURE:** Samples that are too wet or dry will not give accurate maturity test results. A small handful of compost squeezed tightly should feel wet, but NOT yield any free water. If there is free water, spread the sample out to dry to the proper moisture level- at least overnight. A second handful of compost squeezed tightly in a paper towel should wet the paper towel — if not, it is too dry. If the sample is too dry, then mix in water very gradually. Repeat the squeeze test to confirm that the moisture is in the proper range.



4. **LOAD COMPOST INTO THE JAR:** Fill the jar to the fill line, while ensuring proper density by sharply tapping the bottom of the jar on a counter. Fluffy or coarse compost should be compacted by pressing firmly into the jar. Let the sample "air out" in the jar without the lid for one hour before starting the test. This will help displace carbon-dioxide that may have accumulated in the sample prior to running the test.



5. **EQUILIBRATION STEP:** If the compost was sampled from a hot pile, or if it was frozen, or if it needed remoistening or drying, then let the sample equilibrate in the test jar overnight with the lid loose before starting the test. If the compost was very dry it may need 48 hours of equilibration before the Solvita (or any CO₂ or oxygen uptake test) gives accurate results. This can be easily confirmed by doing the Solvita test on the same sample set-up after 1, 2, and 3 days in the test jar, equilibrating with the lid loose between tests.

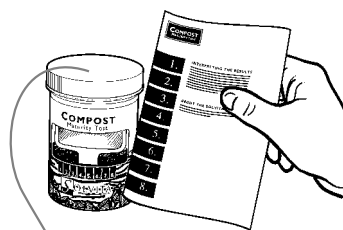
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RUNNING THE SOLVITA TEST



1. **OPEN BOTH TYPES OF FOIL PACKS:** The Solvita test is actually two tests in one, carried out in the same 4-hour test period. Both the individual paddles marked either "Carbon-Dioxide" or "Ammonia" are opened by tearing along the top and carefully removing the paddle by grasping the handle. The gel-paddles are color-coded: the carbon-dioxide paddle (marked with "C" on the stem) is purple at the start and the ammonia paddle (marked with "A") is yellow. *Do not touch the special gel surface, and don't allow compost to touch it.* Once the gelpack is opened, the test should be started within 30-minutes. The gel is non-toxic but should be kept out of the mouth and eyes.

2. **INSERT THE PADDLES:** The gel paddles are pushed into the compost sample in the jar so that by looking through the clear side you can see each of the color surfaces, as indicated by the color squares on the jar label. The edges of the paddles can be touching in the middle at about right angles. Push the paddle tips all the way into the compost to the bottom of the jar. Be careful not to jostle or tip the jar.



3. **SCREW THE LID TIGHT,** and keep the jar at room temperature (68—77°F or 20—25°C) *out of direct sunlight* for 4 hours.

4. **READ THE GEL COLOR.** At the correct time (4 hours) after the jar has been sealed, read the gel colors by comparing to the two color charts. Mark the results on the lid label. Color matching is best under moderate intensity fluorescent room light, with the paddle left in the jar with the lid on and illuminated from the front. For reading in daylight or incandescent lighting, remove the paddle and lay it face-up on a clean, white surface. It is advisable to judge the colors by darkness as well as hue.

5. **USING THE VALIDATION FORM:** We have provided a convenient removable lid label to aid in the documentation of the results from Solvita testing. A pre-punched monitoring sheet is provided along with the test kit. The Solvita lid label may be peeled off the jar after the test and affixed to the monitoring sheet and stored in a binder to document the test.

SOLVITA™

Date _____ Initials _____

Sample I.D. _____

Start Time _____ Read Time _____

CO₂ Result # _____

NH₃ Result # _____

Temperature _____

Removable Solvita Label for Quality Control Monitoring

THE COMPOST MATURITY INDEX

The *Maturity Index* is determined using the results from both paddles. The numbers from the color charts are lined up in Table 1 below, to read the intersection which is the Index. This Index number may be used later for the interpretations in Tables 2, 3, 4, and 8.

The Index results simply by using the ammonia to compensate for the apparent CO₂-stability. High ammonia levels encountered in some composts can inhibit microbial activity or interfere in the CO₂ test. Also, ammonia by itself is dangerous for compost use on plants. By using both indices, the test more accurately depicts stability/maturity than any other test alone..

TABLE #1: Compost Maturity Index Table^a

use the A and C paddle color numbers and read across and down to where the columns meet

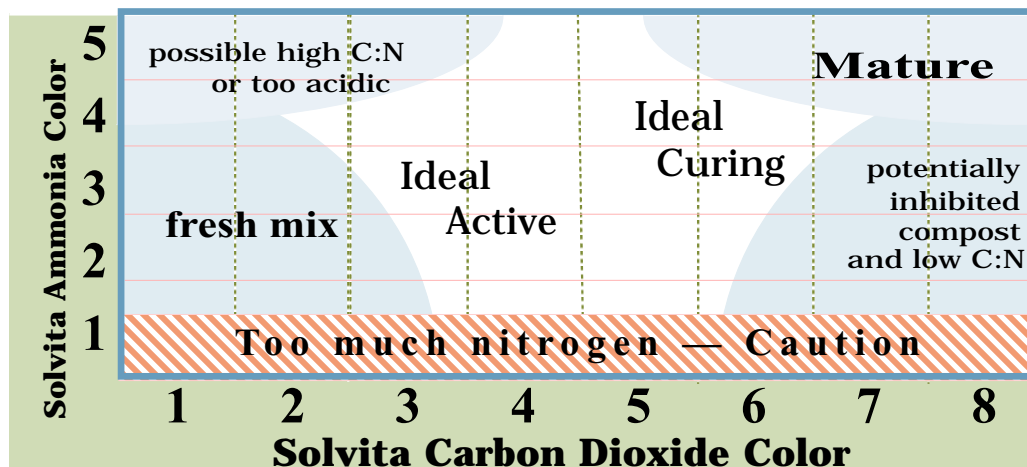
		SOLVITA Carbon Dioxide Test Result is:								
		↓	1	2	3	4	5	6	7	8
Solvita Ammonia Test Result is:	5	Very Low NH ₃	1	2	3	4	5	6	7	8
	4	Low NH ₃	1	2	3	4	5	6	7	8
	3	Medium NH ₃	1	1	2	3	4	5	6	7
	2	High NH ₃	1	1	1	2	3	4	5	6
	1	Very High NH ₃	1	1	1	1	1	2	3	4

a. Example: If the NH₃ result is 2, and the CO₂ result is 6, then the Maturity Index is: 4

The following table shows a visual overview of your compost condition based on the two tests.

TABLE #2: Interpreting General Compost Condition with Solvita Ratings

use the A and C paddle color numbers and read across and down to where the columns meet



INTERPRETING THE SOLVITA® MATURITY INDEX- Equivalency to Other Tests

As compost ages, it normally goes from a fresh condition (Solvita #1-2) to a mature state (Solvita #7-8). This can take weeks to months, depending on the materials and method of composting. The following table presents an overview of this aging process and shows how other tests that are used to characterize stability can be compared to the Solvita test.

TABLE #3: Solvita® Compost Maturity Index and Other Indexes

IF SOLVITA MATURITY INDEX IS:	THE STAGE OF THE COMPOSTING PROCESS IS:	Equivalency to other maturity indicators ^a		
		DEWAR ^(b)	CO ₂ Rate ^(c)	O ₂ -Rate ^(d)
8.	Inactive, highly matured compost, very well aged, possibly over-aged, like soil; no limitations for usage	V	1	<3
7.	Well matured, aged compost, cured; few limitations for usage		2	5
6.	Curing; aeration requirement reduced; compost ready for piling; significantly reduced management requirements	IV	4	11
5.	Compost is moving past the active phase of decomposition and ready for curing; reduced need for intensive handling		6	16
4.	Compost in medium or moderately active stage of decomposition; needs on-going management		8	21
3.	Active compost; fresh ingredients, still needs intensive oversight and management		10	27
2.	Very active, putrescible fresh compost; high-respiration rate; needs very intensive aeration and/or turning	I	12	32
1.	Fresh, raw compost; typical of new mixes; extremely high rate of decomposition; putrescible or very odorous material		>15	> 40

a. Note: this table gives approximate equivalency based on average organic matter and density.

b. DEWAR = Dewar self-heating test using standardized Dewar Flask

c. CO₂ Rate = total mg CO₂-C evolved per g VS per day

d. O₂ Rate (SOUR) = mg oxygen (O₂) consumed per g VS per day

BEST USE OF COMPOST PRODUCTS BASED ON THE SOLVITA MATURITY INDEX

The Solvita® Maturity Index can be used to identify the best use category of a compost. This method takes into account limitations known to exist with regard to CO₂-evolution rate and ammonia content. The table also shows typical associations with other known soil amendments. All composts should always be checked under actual growing conditions. Many states and some countries that specify Solvita testing require compost to be at or above a certain value in order to be considered a finished product*.

Table 4: Best Use Of Compost

SOLVITA MATURITY INDEX											Material in this class will be similar to:
	Raw Feedstock- Mushroom Compost	Landspreading on fallow soil; Mulch	Farm Row Crops, Field Cultivation	Hothouse Beds, Greenhouses	Orchards, Pastures, Hay Crops, Turf	Topsoil Substitute Blends	General Gardening	Bedding Plants, Container Media	Potting Mixes, Seedling Starters		
8.				✓	✓	✓	✓	✓	soil & peat-based mixes		
7.			✓	✓	✓	✓	✓	✓	soil mixes		
6.			✓	✓	✓	✓			compost-soil blends		
5.		✓	✓	✓					organic fertilizers		
4.	✓	✓	✓						un-treated organic fertilizers		
3.	✓	✓	✓						dehydrated manures		
2.	✓	✓							raw-waste and most manures		
1.	✓								raw-waste & some manures		

↑

Increase wait time prior to planting

↓

Control Limit: ID

Control Limit: CA, MA,

Control Limit: WA, TX

Control Limit, CA, MA,

Control Limit: ID, WA, TX

Increase wait time prior to planting

Note: There are factors other than maturity index that determine how well a compost will perform with crops. These include, but are not limited to, nutrient content, nitrogen-release, pH, and salinity. You may wish to have a full-service compost laboratory such as Woods End analyze the sample. Please write to Woods End or see www.woodsends.org for a full list of recommended tests and analytical interpretation guidelines. *Note: see the web site for up-to-date information on State or National regulations that specify Solvita testing

Appendix I. INTERPRETING SOLVITA® AMMONIA RESULTS

The Solvita Ammonia Test is used primarily to derive the Maturity Index (Table 1). It is optionally possible to use the test to obtain more information about your compost. This is because presence of ammonia indicates the relative nitrogen content, stability and age of the material. You can use this information in these other two ways:

1. Ammonia in compost may be noxious to workers and can be toxic to some plants. It is often responsible for the "burn" effect after applying to some crops (see Table 4, 5). High ammonia content, however, may also indicate a potential positive crop response when applied correctly to heavy-feeder field crops such as corn, sorghum, etc.
2. You can estimate *total ammoniacal nitrogen* in the sample if you know the compost pH (Table 6). This provides important clues about the C:N balance and maturity (see Table 2 and 7).

TABLE #5: Potential Phytotoxicity Associated with Ammonia Gas

Ammonia Color No:	1	2	3	4	5
Potential Phytotoxicity is:	Very High	High	Medium	Slight	None

Under normal conditions, ammonia increases during the period of rapid decomposition, then declines or disappears as the compost matures. The pH of the compost tends to follow this cycle of ammonia, reaching 8.5-9.0 when the ammonia content is high. This cycle is affected by the balance of available carbon and nitrogen in the compost mix, expressed as the C:N ratio. A surplus of *nitrogen* (C:N < 25) can cause elevated ammonia throughout the composting process, resulting in nitrogen loss and delay of maturity due to elevated pH. Conversely, *nitrogen deficiency* (C:N > 35) results in relatively low ammonia content, and possible delay in maturity due to inadequate supply of nitrogen.

TABLE #6: Estimating Total Ammoniacal-N in Compost (ppm dry basis)

Ammonia Color No:	1	2	3	4	5
Compost pH = 7.0	n/a	n/a	> 10,000	8000	< 4000
7.5	n/a	> 15,000	8000	4000	< 2000
8.0	> 20,000	10,000	4000	2000	< 1000
8.5	> 7000	3000	1500	600	< 400
9.0	> 4000	1500	700	300	< 200

TABLE #7: Interpreting Compost Stability Based on Ammoniacal-N Content

Ammonium level is:	> 10,000	4000-10,000	500-4000	100-500	< 100
Compost Condition	Very Active	Med. Active	Curing	Cured	Mature

Table 7 shows how the total ammoniacal-N content relates to the condition or decomposition state of typical compost having moderate or surplus nitrogen. If the nitrogen is low (i.e. high C:N ratio), then ammonia may be low even if the compost is immature (see Table 2). Ammonia's pH-raising effect is sometimes counteracted by volatile fatty acids in very active compost, especially if oxygen demand is not being met. □

Appendix II. INTERPRETING SOLVITA® INDEX RESULTS

TABLE #8: Troubleshooting Compost based on Solvita® Results

Indicated Problem or Result	Possible Explanation	Possible Remedy
Compost is young but test results indicate “mature”	Compost may be very low in organic matter and have low overall respiration	Check organic content; add more organic-rich ingredients; check self-heating
	Compost may be inhibited by low or high pH; very dry or very hot prior conditions; check Solvita ammonia test	Check pH and VOA level; correct moisture; test again 1-2 days later
Compost is old but Solvita results indicate “active” and/or high ammonia levels	Compost may have composted improperly and not advanced significantly, e.g. it is too wet or too dry, too compacted, poor mix of ingredients, not enough air	Turn pile, loosen material, add moisture or “green” materials if needed; if high in ammonia select for field rather than seedling use
Compost has given the same Solvita colors on several tests at 1-2 weeks apart	Compost is not progressing properly— it may be too dry or too compacted, not well mixed; C:N or pH is too high or too low	If pile looks woody add green matter; add moisture if too dry; loosen if too dense
Different parts of the pile give different Solvita colors	Pockets of poorly mixed or poorly aerated material exist	Re-mix entire pile and re-sample and test again
Core is always #1 or #2 on Maturity Scale	Core is anaerobic and/or is not composting properly	Provide coarse structural materials, mix pile or add air; pile may be too large
Solvita colors indicate very “mature” but plants were hurt by compost	Compost contains high levels of salts, VOA or pH is too low	Check pH and conductivity before use; allow to compost more; allow to mature in soil before planting
Color doesn’t match the color chart	Package may have leaked air prior to the test or is defective	Discard paddle and request replacement product
Unexpected CO ₂ vs. ammonia paddle results	unusual or extreme conditions persist; check paddle quality	See table 2

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