Guidelines for Applicants

This is one of a series of guidelines to help applicants to the Smart Approved WaterMark, Australia's outdoor water conservation label. Applications to the Smart WaterMark are assessed by an Independent Technical Expert Panel against the following four criteria:

1. **Water Saving -** The primary purpose of the product is directly related to reducing actual water use and where there is a direct correlation between the use of the product and water savings.
2. **Fitness for Purpose -** Supporting documentation (such as instructions and marketing material) helps ensure that users get the best water savings/efficiency from the product.
3. **Meeting Regulations and Standards -** The product is of high quality and meets industry standards, and customer and community expectations.
4. **Environmentally Sustainable -** The product, while satisfying the above three criteria, is environmentally sustainable, and that in making water savings the product will not adversely impact on the environment in other areas.

Guideline 3.
Soil Amendments for Increasing Soil Water Retention

The Expert Panel needs verifiable independent evidence that the product achieves the water savings claimed in the application (i.e. through independent testing, case studies or comparative reports). Please note, unsubstantiated marketing claims are not regarded as evidence of water saving.

The Expert Panel does not insist on a specific test to prove the water-saving properties of soil amendments such as water crystals. However, the experiment overleaf has been devised so that applicants are aware of the kind of test needed to support your application.

The Smart WaterMark stakeholder web site has further information on the application process including forms, timetables and fee rates at: www.smartwatermark.info

If you have any questions about these guidelines or your application please contact the Smart WaterMark national office. Email: info@smartwatermark.info Landline: +61 (0) 2 9223 3322

Smart Approved WaterMark is Australia's water saving labelling program for products and services which are helping to reduce outdoor water use. The Smart WaterMark is run by the Water Services Association of Australia, Irrigation Australia, the Nursery and Garden Industry Australia and the Australian Water Association with funding from the Australian Government's Water Smart Australia programme through the Department of the Environment, Water, Heritage and the Arts.

Assessing water-saving capability of soil amendments for increasing soil water retention: An experimental approach

Aim

To determine if incorporating water absorbent materials such as water crystals into soil and potting media reduces water usage.

Experimental design

4 media types (unamended soil, soil + water crystals, unamended potting mix, potting mix + water crystals) x 4 watering rates (40%, 60%, 80%, and 100% watering requirement) x 4 replicates (64 pots).

All pots will be planted with a leafy ornamental or vegetable that is sensitive to water availability. Ornamentals **or** vegetables of the same variety should be used throughout the experiment, not a mixture of both.

The unamended soil and potting mix treatments (i.e. **no** water crystals or other soil amendments) watered at 100% replacement represent the 'control' treatments. The soil should ideally be a sandy loam. The potting media should ideally be an Australian Standards approved mix, and contain **no** premixed water crystals or other specific water absorbent materials such as peat.

Ideally, the experiment would be conducted in a glasshouse.

Method

Establishing plants

1. Purchase 64 large pots of the same dimensions and that contain drainage holes and label the pots.
2. Mix water crystals or other absorbent material evenly into the soil / potting media at the recommended application rate.
3. Fill each pot with approximately the same amount of soil or potting mix. Plant two leafy ornamental or vegetable plants into each pot. Ensure that plant sizes are as uniform as possible. Plants with large leaf surfaces (such as lettuce or cineraria) are preferable. Water all pots well to ensure the crystals are fully hydrated and the soil / potting media is moist.
4. So that the plants are given time to establish in the soil or potting media, the plants should be grown and watered as normal for a minimum of 2 weeks, including applications of soluble fertiliser to ensure plants remain healthy. Each plant should be treated in the same manner and receive equal amounts of sunlight, water and nutrients. Preferably the pots should be randomised. Wetting agents should not be applied.
5. The plants should be sufficiently established once the root systems have grown into the majority of the soil / potting media in the pots. Before commencing experiment thin to one plant per pot.

Measuring water savings

6. Once plants are established, water all the pots such that they are fully moistened (to field capacity)(see Note 3 below for instructions on how to determine field capacity).
7. Pots will need to be shielded from rainfall or any other irrigation.
8. Over the following hours / days, carefully monitor the plants for signs of wilting. As soon as there are any signs of wilting in any of the **control** pots / treatments, re-water **all** the pots as per the following guidelines:

   For each of the 4 treatments (unamended soil, soil + water crystals, unamended potting mix, potting mix + water crystals):
   - Water 4 pots at 100% of requirement
   - Water 4 pots at 80% of requirement
   - Water 4 pots at 60% of requirement
   - Water 4 pots at 40% of requirement

   The above %'s of water reduction are a guideline only. Different %'s of water reduction can be used as per the proposed / estimated water savings for the product/s being trialled, for example, 90%, 75%, 50% etc. Watering should be done via a watering can (rather than via sprinklers or a drip irrigation system) so that the water being applied can be accurately measured.
9. Continuing over the following hours / days, carefully monitor the control plants for further signs of wilting and note the date / time that wilting is evident. Re-water all the pots as per the above guidelines (i.e. re-water when the **control** plants are starting to wilt), and continue this pattern of watering for a minimum of 2 weeks. For all treatments, note the amount of water applied to the pots, the time to wilting and also the time at which plants do not recover from wilting overnight (permanent wilting point). Also note, for all treatments, any observations about general plant health such as leaf yellowing and stunting of growth.

Presentation of Results

Tabulate the times for each treatment and each replicate, and calculate the average time to wilting for each treatment. For example, for the soil + water crystals treatment:

Pot No.	Treatment	Amount of water added	Replicate	Time to wilting (hours or days) prior to each watering, over 2 weeks					Average time to wilting
1	Soil + water crystals at 100% watering		1	48hrs. Healthy plant	48hrs. Healthy plant	48hrs. Healthy plant	48hrs. Healthy plant	48hrs. Healthy plant	48 hours
2	Soil + water crystals at 100% watering		2	50hrs. Healthy plant	50hrs. Healthy plant	50hrs. Healthy plant	50hrs. Healthy plant	50hrs. Healthy plant	
3	Soil + water crystals at 100% watering		3	48hrs. Healthy plant	48hrs. Healthy plant	48hrs. Healthy plant	48hrs. Healthy plant	48hrs. Healthy plant	
4	Soil + water crystals at 100% watering		4	46hrs. Healthy plant	46hrs. Healthy plant	46hrs. Healthy plant	46hrs. Healthy plant	46hrs. Healthy plant	
5	Soil + water crystals at 80% watering		1	30hrs. Healthy plant	30hrs. Healthy plant	30hrs. Healthy plant	30hrs. Minor leaf yellowing	30hrs. Leaf yellowing	30 hours
6	Soil + water crystals at 80% watering		2	30hrs. Healthy plant	30hrs. Healthy plant	30hrs. Healthy plant	30hrs. Minor leaf yellowing	30hrs. Leaf yellowing	
7	Soil + water crystals at 80% watering		3	32hrs. Healthy plant	32hrs. Healthy plant	32hrs. Healthy plant	32hrs. Minor leaf yellowing	32hrs. Leaf yellowing	
8	Soil + water crystals at 80% watering		4	28hrs. Healthy plant	28hrs. Healthy plant	28hrs. Healthy plant	28hrs. Minor leaf yellowing	28hrs. Leaf yellowing	
9	Soil + water crystals at 60% watering		1	20hrs. Healthy plant	20hrs. Minor leaf yellowing	20hrs. Leaf yellowing	20hrs. PWP	20hrs. PWP	20 hours
10	Soil + water crystals at 60% watering		2	18hrs. Healthy plant	18hrs. Minor leaf yellowing	18hrs. Leaf yellowing	18hrs. PWP	18hrs. PWP	
11	Soil + water crystals at 60% watering		3	20hrs. Healthy plant	20hrs. Minor leaf yellowing	20hrs. Leaf yellowing	20hrs. PWP	20hrs. PWP	
12	Soil + water crystals at 60% watering		4	22hrs. Healthy plant	22hrs. Minor leaf yellowing	22hrs. Leaf yellowing	22hrs. PWP	22hrs. PWP	
13	Soil + water crystals at 40% watering		1	10hrs. Wilting	10hrs. Severe wilting	PWP	PWP	Plant dead	11 hours then plant death
14 etc	Soil + water crystals at 40% watering		2	12hrs. Wilting	12hrs. Severe wilting	PWP	PWP	Plant dead	

** PWP = permanent wilting point (plants do not recover overnight)*

In the above example, water savings are not demonstrated, as when plants are watered at 80% of their requirement, plant health deteriorates compared to the control treatments.

Water savings are demonstrated by there being equivalent plant health (versus the control treatment) with decreasing amounts of water being applied.

Notes

1. The exact size of the pots is not important however the same pot dimensions should be used for each of the replicates. Using smaller pots increases the likelihood of detecting changes in water savings.
2. It is important that the soil and potting media used is exactly the same in all pots (for that treatment). The texture of the soil or potting mix may also affect the sensitivity of the test. For example, as sandy soils are more prone to drying than say a clay soil, the effectiveness of the crystals may be more detectable in the short-term when a sandy soil is used.
3. The field capacity of the soil is described as the state of the soil 'after rapid drainage has effectively ceased and the soil water content has become relatively stable'. Various techniques ranging in sophistication can be used to determine field capacity; however the simple method proposed here is adequate.
4. To determine the field capacity of the test soil, fill 12 containers (e.g. 250 ml) with drainage holes with the soil /potting mix of interest. Add water evenly to the surface of the soil, and Continue to so until water drains from the base of the container. Cover the pot so as to avoid surface evaporation, and allow to stand indoors for 24 hours. After 24 hours, determine the gravimetric water (g H_2O g-1 dry soil) content of the soil UNDER the surface 3–5mm. This is the gravimetric water content at which the test soil is at field capacity. Use the gravimetric water content of the soil at field capacity to calculate the amount of water needed raise the soil water content of testing pots to field capacity (water required (g) = gravimetric water content water (g H_2O g-1 dry soil) times the dry weight of soil in testing pot (g)).