

GYPSUM BLOCKS

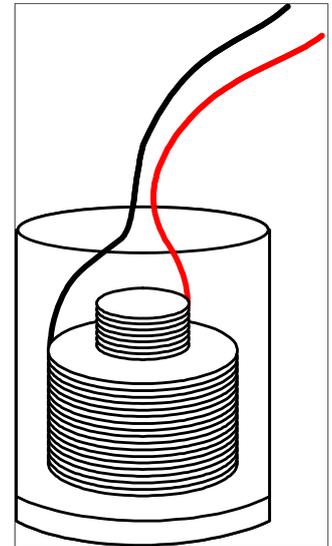
How do gypsum blocks work?^{1,2}

Electrical Properties

The Gypsum Block is a cylindrical block of gypsum (CaSO_4) into which two electrodes are inserted. The porous gypsum allows water to move in and out of the block as the soil wets (under irrigation or rainfall) and dries (as the plant draws water away). The CaSO_4 goes into solution and allows ion movement between the two electrodes. When the block is excited electrically, electrical resistance between the two electrodes is measured and related to moisture content as a tension.

Tension Properties

The tension range measured by the block is highly dependent on soil type. Heavy clays hold onto water particles very tightly and hence a plant may need to exert a large amount of tension to the soil (in the order of 100's of kPa) to extract available water. Alternatively, very sandy soils drain freely under gravity and have little capacity to hold onto water. As a result, the highest achievable tension may only be 10's of kPa before the soil is dry. **Therefore, you will need to select a product that is suitable for your soil type and for the tension range of your crop.** For example, vegetables generally operate on an irrigation point of -20 kPa.



Source: Measurement Engineering Australia

Calibration

Gypsum is a uniform material and gypsum blocks are manufactured under carefully controlled conditions. As such, gypsum blocks do not need calibration. Each block translates resistance directly to kPa.

Readings may be taken manually[#] using a hand-held reader, or with a logger and retrieval device. Both of these methods have a small amount of memory, but downloads and transfer of information to a computer are required on a fairly regular basis.

#Note that specialist hardware is required to read gypsum blocks as the electrical excitation must be AC and must be small enough in magnitude to prevent long term damage to the block through measurements. Ask your supplier about the hardware you require to read the block.

Advantages:³

- Cheap in comparison to other systems
- Easy to use and install
- GB Lite™ is one product that is able to measure the lower end of soil tension
- Readings are not affected by soil salinity - although the life of the block can be
- Measurements can be taken quickly and some products are able to be logged
- Direct indication of plant suction in kPa provides easy identification of the 'refill' point, when irrigation is required
- MEA products at least, and servicing are available from local businesses

Disadvantages:³

- Requires labour input to take readings or download to computer
- Lifetime can be reduced in some soil types
- Relatively small sphere of influence
- GB Heavy™ is less responsive at low end of plant suction

The products and companies mentioned on this fact sheet are examples only and are not endorsed in any way. Other tools with similar functions may also be available. Irrigators are advised to speak to an Irrigation consultant or the companies who sell the equipment, for more information on the best system to suit their requirements.

GYP SUM B L O C K S

How long will a gypsum block last?¹

The lifetime of a gypsum block is somewhat variable and is dependent on the soil type and other site specific factors. Ultimately the gypsum block will dissolve into the surrounding soil and this process can occur over a period of between 1 year (in the very worst case) and 5 or more years (in the best case).

Note that some products are composite blocks and due to their construction have a much longer operational lifetime than a straight gypsum block - a 10 year life span is typical for these composites.

Factors which affect gypsum block lifetime include

- Soil wetness: a wetter long term installation will result in greater ion liberation (i.e. gypsum block dissolves more quickly)
- Erosion: preferential water flow past the block can cause block erosion
- Soil pH/Salinity: saline soils will liberate ions from the gypsum block more quickly than for neutral soils.

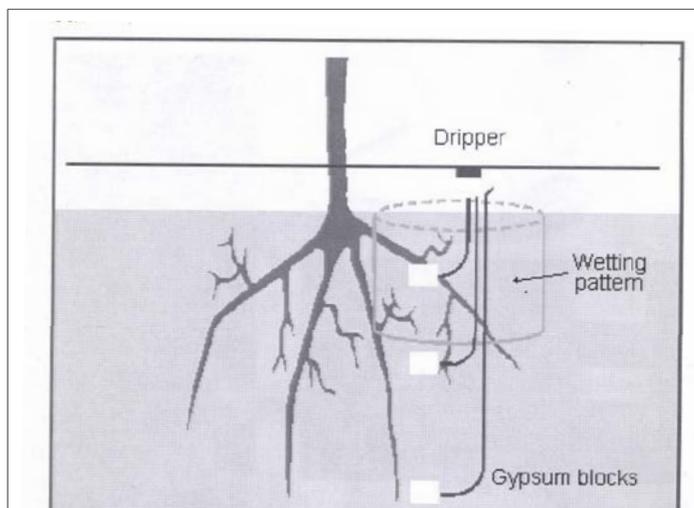


Figure 4. Recommended placement of gypsum block in relation to the emitter, the wetting pattern and the root distribution under a vine (from P.D. Mitchell and I. Goodwin, *Micro Irrigation of vines and fruit trees, Agriculture Victoria, 1996, Agmedia*)

How do you know when to replace them?

As with any soil moisture monitoring system it is important to check the conditions in the field at various times, as a block that is getting near to the end of its will start to give incorrect readings. By checking conditions in the field you will know whether the readings are accurate or not.

Further information

Agriculture Western Australia Farm Note 3/98: Using gypsum blocks to measure soil moisture in vineyards

<http://www.agric.wa.gov.au/content/lwe/water/irr/f00398.pdf>

Resurrecting the Gypsum Block for Soil Moisture Measurement

www.sowacs.com/archives/98-02/msg00000.html

Department of Primary Industries Victoria

www.dpi.vic.gov.au

References:

1. <http://www.mea.com.au/Products/Soil/GB/FAQ-GB.html#howwork>

2. **Mallee Water Resources Committee and PIRSA** (revised 2002) *Mallee Wells Irrigation Management Course Manual*

3. **Improving Irrigation Efficiency Project** - Irrigation Management Course, Irrigation Scheduling Equipment Workshop presentation