LYNN MACEY sent in some delightful cartoons about CP which came from a book called Gleeful Guide to Communicating with Plants to Help Them Grow by Will Eisner. We are always delighted to receive copies of either original cartoons or those printed in various magazines and newspapers. We already have a sizable collection and perhaps some day we can reprint the best from this collection in CPN.

SHORT NOTES

TAP WATER PURIFICATION BY REVERSE OSMOSIS

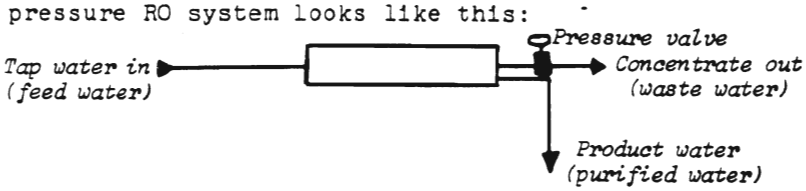
by Bob Hanrahan

Possibly the greatest obstacle for many of us to increase our CP collection is the problem and cost of obtaining mineral free water. It's not a secret that a majority of our plants naturally grow in pure water areas. (Ref. CPN Vol. 1, No. 1, p.6) Striving to duplicate the natural environment can require the use of high cost distilled or deionized water. This article will present an alternative for CP buffs in utilizing a fairly new water purification process called Reverse Osmosis (RO) to produce high quality low cost water. The cost per gallon will vary as to the purity of the tap water used, but generally will be less than 2¢ per gallon. A complete ready-to-use RO system is available for under $65.00 (U.S.)

In simple terms, RO is a process that forces water under pressure through a special membrane filter to remove 90-95% of all water impurities. There are two basic module types available; a low pressure module (operates with water pressure between 30 and 175 psig) and the expensive high pressure systems (200-600 psig). For our use, the low pressure modules are ideal as they work nicely off normal tap water pressure levels (60 psig).

Gallon per day (gpd) output or product flow, varies as to the design of the module and line pressure. Available modules produce 5, 15 or 25 gpd at 60 psig. Output will be considerably higher with greater pressure levels but make sure you don't exceed the specified maximum pressure. RO modules are easily ganged to meet just about any large requirement. I find the 5 gpd system more than sufficient for my use and find myself using it about four days per week.

Pictorially, a low pressure RO system looks like this:



To accomplish better than a 10 to 1 reduction in total ppm, 10 gallons of feed water are required to produce 1 gallon of product water. This feed-to-product ratio can be adjusted lower, but a sacrifice in ppm reduction is made. More important, the life of the module is really reduced. The concentrate water need not be totally wasted. I use it to supply my swamp cooler with water and the rest to humidify my greenhouse. With 400 to 500 ppm feed water, a module will last at least one to two years running continuously. Deviating plus or minus from this ppm count will either shorten or lengthen the life span.

To produce distilled quality water or better, a DI cartridge can be attached directly to the RO product water. Most CP like water low in salts with a ppm count of 30 or less. So if your tap water is much over 440 ppm and/or you do not have provisions for continual leaching of the soil medium, you should consider DI. DI cartridges are generally rated in grain capacity. You will have to convert your ppm count to grains to calculate the life expectancy of the DI unit and its operating cost. For me, it works out at about 2.4¢ to convert 35 ppm water (2 grains) to 0 ppm DI water. Without using RO first, the cost would be 24¢ per gallon, the advantage of RO is quite evident.

Two important factors must be considered before an RO or RO-DI system is contemplated:

1. The feed water must be chlorinated or a bacterial killing agent like chlorine must be injected into the module to kill any bacteria that could destroy the membrane. A few drops added weekly to the feed port will do this if your water supply is direct from a well or untreated. Fortunately, most public drinking water supplies (U.S.) are chlorinated but it is best to check with your local water company to be sure.

2. The total dissolved solids (TDS) of the feed water must be less than 1000 ppm and below a pH of 8.5. Actually a TDS of 1000 is considered undrinkable by the U.S. Government, so hopefully we need not consider this. Again, check with the local water company or check your water yourself with an inexpensive TDS test kit from a tropical fish store.

The convenience of having quality water available at all times and at a fraction of the cost of commercially distilled or deionized water makes the application of RO or RO-DI highly feasible and realistic for the CP hobbyist.

Glossary

ppm (parts per million)	A measurement in terms of solids weight, of any character, which are dissolved in 1 million equivalent parts of water. (8.3 lbs. solidsin 1 million gallons of water)
deionized water	Water that has gone through an ion exchange process to produce very pure water. Also known as demineralization. (Do not confuse with water softeners, they actually increase the total ppm.)
distilled water	Water that has been evaporated and recondensed. Produces water with a ppm count of less than 10.
grain per gallon	One grain equals 1/7000 lb. or 17.1 ppm = 1 grain per U.S. gallon. In metric, 1 ppm = 1 g per cu meter = 1 mg per liter.
conductance to ppm conversion	To convert a water conductance measurement (mmho) to its ppm equivalent, simply divide by 2. (Example: 40 mmho = 20 ppm.)

For those interested in specific elemental rejections from an RO system, I have included a report from a water testing laboratory that analyzed feed and product water from a 5 gpd low pressure module.

(Cations)	Feed (ppm)	Product (ppm)	(Anions)	Feed (ppm)	Product (ppm)
Calcium	44.	1.	Carbonate	Nil	Nil
Magnesium	37.	0.8	Bicarbonate	231.7	12.6
Sodium	100.	6.30	Sulfate	379.	32.0
Potassium	4.74	.11	Chloride	91.2	11.5

	Feed	Product
Hardness ($CaCO_3$)	262.2	5.70
Alkalinity ($CaCO_3$)	231.7	12.6
TDS	538.0	11.0

Special RO systems are available from: Agro Products, 9447 E. Artesia Blvd., Bellflower, California 90706. Write for current prices.

A TRIP TO ARTHUR PASS, NEW ZEALAND
by Jim Forrest

The day dawned clear and sunny, the weather report was good, but neither of these counts for much in what you'll find in the Alps. The main Divide is a divide in more ways than one, and particularly in relation to weather. Leaving Christchurch, you travel north-west along straight paved highways for thirty miles or so to the front ranges of the Alps across the intensively farmed Canterbury Plains.

The first range is climbed by Porter's Pass to a height just over 1000 meters (3000 feet) and a stiff climb too! The road winds for another 70-odd miles to Arthur Pass, skirting mountain ranges up and down, across stony riverbeds, and often alongside wide stony rivers which become raging torrents after rain or when a hot northwest wind melts the snow. The mountains are almost devoid of vegetation and are masses of moving rock--a tribute to one hundred years of burning and overgrazing.

We arrived at the summit which lived up to its reputation--it was raining for 100 meters on our side. The Pass is the center of a national park so some attempt has been made to preserve the vegetation. Alongside the road were small lakes and wet areas and it was here I looked for Drosera.

Drosera arcturi was here by the acre in full flower and plants that could be counted in the thousands. D. spathulata was present also, but not in such vast numbers. Both plants were noticeable for the brilliant red coloring backed by the white flowers--single in the case of D. arcturi. The plants were in some cases growing in sphagnum but in general just in a mass of peat, mires, roots, sedges, etc. The water level in the ponds was about 3 cm. (one inch) below the surface and this I presume kept the temperature for the plants down. In winter, the area will be frozen or covered in snow for months. I couldn't find D. stenopetala which is much more localized. No luck with Utricularias either. Some idea of the weather barrier can be gained from the fact that at the Pass rainfall is about 5000 mm. yet about 10 Km. away it is down to 800 mm. Further south, the contrast is even greater.