WEEDS

COPING WITH SALT - THE ICEPLANT WAY

Penny Hussey

Any plant living in salty water has a problem, how can it get at the water despite the salt?

Plants take in water through their cell membranes by a process called osmosis. The sugary cell sap is more concentrated than the soil water, so osmotic pressure draws water into the cell. But if the water outside is salty, it can draw fresh water the other way - out of the cell. Thus, although surrounded by water, the plant will die of drought. Some plants, however, are able to cope with the harsh conditions – how do they do so? One successful group are the iceplants.

Slender Iceplant (Mesembry-anthemum nodiflorum)

Right across the cropping belt where you have saline loamy soils, iceplants (*Mesembryanthemum crystallinum* and *M. nodiflorum*) can be found. Introduced from South Africa, they are sprawling plants with leaves that glisten like crystal, and superficially daisy-like cream or white flowers.

Iceplants are in the pigface family, Aizoaceae, a worldwide family of shrubs and herbs most of which have specialised adaptations to periods of low moisture availability. Many, such as the bizarre 'living stones' of South Africa, live in deserts, while others live in saline areas. Of the 2,500 species worldwide, there are 18 genera and 60 species in Australia, eight genera and 39 species being native. In WA there are 29 native and 12 introduced naturalised species.

Most plants in this family are succulents, storing water in their leaves. They flower after good rains, mostly in bright reds, pinks and yellows, forming spectacular 'carpets of colour' in their native southern Africa's Succulent Karoo vegetation type. Because of their colour and general hardiness, many are popular garden plants*.

Many (perhaps all?) of the plants in the family exhibit an unusual method of photosynthesis. Ordinary photosynthesis is termed the C_3 process, but pigfaces also use another chemical pathway, called the CAM (Crassulacean Acid Metabolism) process which is adapted to water stress conditions. C_3 plants take in CO_2 through their stomata during the day, but CAM plants close their stomata during the day and open them at night, so minimising water loss by transpiration. Iceplants can switch from one mechanism to another, depending on fresh water availability in their root zone. The C_3 process is much more efficient during the winter growing period, but CAM will keep them growing and seeds maturing as the ground dries out.

The shining effect of their leaves is because they are covered with a layer of transparent, liquid-filled 'blisters'. What are they for? Well, they are garbage bags - excess salt drawn from deep underground is packed in them, out of the way of productive cells. When the plant dies in summer, or the leaf is shed, this extra salt contributes to surface salinity.

Thus iceplants are actively contributing to surface soil salinity, and may have a strong negative effect on the growth of other winter-growing annuals – including crops – and they are, unfortunately, an increasingly common weed of crop paddocks. Another problem with iceplants is that they accumulate oxalate in their tissues and this material can be poisonous to stock, thus it is not a good species to have in grazing paddocks either. In bushland, they probably have a similar negative effect on the germination of annuals, such as everlasting daisies, and also on seedling regeneration of native shrubs. All in all, a plant to discourage!

Definite recommendations for the control of this plant have not been developed as yet, but DAFWA has undertaken trials at both Northam and Three Springs. A metasulphuron herbicide (such as Ally®) at 5 gm/ha (trialled under a minor use permit obtained by the Leibe Group) has proved effective in a paddock situation, as has glyphosate at standard rates. (For more detail on herbicide, contact Ed.)

[* See 'Western Weeds' for colour pics of some of the naturalised species. – Ed.]

Broader leaves characterise the Iceplant M. crystallinum