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Variable quality of saltbush seed influences establishment

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Farmers are using niche seeders to direct-seed saltbushes (Atriplex spp.) cheaply on large areas of salt affected land.

While many factors influence successful establishment of these shrubs, farmers can control the quality of the seed they use. Too often, the lack of knowledge of saltbush seed quality has resulted in extremely poor establishment.

The importance of seed quality is well recognized in the establishment of grain crops and pastures, but it is often overlooked when farmers buy or select seed of saltbush. If farmers know the quality of the seed they buy, they can make appropriate adjustments to the sowing rate and avoid one potential cause of establishment failure.

Seed quality depends on the proportion of the seed that will germinate readily (percentage normal seedlings) and the purity of the seed lot. Leaves, stalks, twigs and weeds reduce the purity of the seed lot.

Saltbush seed

The true seeds of saltbush species commonly sown in Western Australia are about one to two millimetres in diameter. The seeds are enclosed by two wing-like, leathery or papery bracts to form a fruit. It is usually the fruit that is germinated to propagate saltbushes. The fruit ranges in size from two to four millimetres for saltbush (Atriplex lentiformis) to the large-winged fruit (15 mm) of marsh saltbush (Atriplex paludosa).

The fruit structure of saltbushes, and the size of the fruit, is a poor indicator of the quality of the seed. With cereal seeds, shrivelled or poorly formed seeds are easily seen. However, for saltbush, the fruit must be opened (the bracts removed) before you can inspect the seed.

Seed quality

Testing by the Department of Agriculture has shown a large variation in germination and purity of saltbush seed lots. Germination of the most commonly sown saltbushes, river saltbush (Atriplex amnicola) and wavy leaf saltbush (Atriplex undulata), ranged from 0 to 75 per cent. Half the seed lots of river saltbush had germination levels of less than 20 per cent. For wavy-leaf saltbush 35 per cent of the seed lots had germination levels of less than 5 per cent (Figure 1).

Some of the seed which doesn’t germinate will be shrivelled and decayed. In many seed lots the ‘seed fill’ (fruit containing a seed) is low, even though the fruits appear large and healthy. Other seed appears healthy, but will not germinate because it is ‘fresh’ and requires an after-ripening period. Research to determine how to make ‘fresh’, seed germinate is proceeding.

Similarly, seed purity has shown a wide variation between species and seed lots. Seed lots of wavy leaf saltbush usually have a high purity because they are easy to clean. However, leaves and twigs are difficult to separate from the fruits of river saltbush and the purity can be less than 50 per cent.
Seed quality and sowing rate

Knowledge of the quality of the seed is essential for determining the most appropriate sowing rate.

In the past, a rate of one to two kilograms per hectare was generally considered appropriate for niche seeding, with a 1.6 m spacing between seed placements and three metres between rows. This would represent 2000 placements per hectare.

For example, river saltbush seed with 40 per cent germination and 90 per cent purity would contain 120,000 germinable seeds per kilogram (that is, a potential 60 seedlings per placement = 120,000 seeds divided by 2000 placements). However, if the germination was only 5 per cent and the purity 50 per cent, there would be only 7500 potential seedlings per kilogram of seed (about four seedlings per placement).

At a seeding rate of one kilogram per hectare, the first seed lot should result in several seeds germinating and establishing at each placement. For the second seed lot, this same seeding rate would result in failure at most placements.

A seeding rate of 50 potential seedlings per placement is recommended, to overcome the many adverse conditions including high salinity, low temperatures and insect pests. This optimizes the chance of at least one seedling establishing at each placement.

Failure to take account of seed quality can result in very poor establishment.

Testing for quality

The Department of Agriculture conducts a weighed replicate test on saltbush seeds (see ‘Weighed replicate test’ on page 132). The test cost $33 in 1991 and takes into account both germination and purity. The result is reported as the number of normal seedlings per kilogram of seed lot. If farmers know the result of a weighed replicate test, they can adjust the sowing rate so that 50 potential seedlings are sown at every placement.
Poor (ABOVE) and good results of germinating saltbush seedlings in a weighed replicate test.

Weighed replicate test

Before 1991, the Department’s germination tests on saltbush seed gave the percentages of these components in the seedlot: germination of normal seedlings, fresh ungerminated seeds (seeds that appear fresh and healthy but do not germinate), abnormal seedlings and dead seed. A farmer also needed to know the number of fruits per kilogram to calculate the appropriate sowing rate.

To provide a more easily used result, the laboratory germination test was changed to one that determines the number of normal seedlings germinating from a known weight of material. This is a weighed replicate test. It is a well known test used for, among other things, eucalyptus seeds in which the seed lot contains a lot of chaff.

The result of the weighed replicate test is given as the number of germinable seeds per kilogram and can be used to calculate sowing rates directly.

The Department changed to a weighed replicate test because the fruits of different saltbush and bluebush species vary in size and therefore the number of seeds per kilogram. In addition, the fruits may not contain a seed or the seed lot contains a high proportion of rubbish.

The test involves four replicates taken from the 100 g of material sent in for testing.

The test sample is spread on to wet germinating paper, which is much like thick crepe paper, and then covered with another sheet of germinating paper. The sheets are rolled up and stood in water so that the line of material is 15 cm above the water level. This provides a good gaseous exchange for seed within the bracts and promotes germination.

The number of seeds germinated is counted at seven, 14 and 21 days. Most seeds germinate between the seventh and 14th day, but the test lasts longer to account for late germination. A less vigorous line of seed could take longer to germinate but still have a high germination.