

***Distichlis* sp. in the Western Australian wheatbelt**

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Background

Distichlis is a halophytic (salt loving) grass traditionally harvested by the American Cocopa Indians for its gluten-free flour that was salt-free and high in bran. It was thought to have died out but several plants were found and seed collected in 1980 by Arizona scientist Dr Nick Yensen, a specialist in saline agriculture. Because *Distichlis* is highly variable, selection and breeding has been undertaken in the United States over some 20 years for traits useful to humans. Certain varieties, which have been patented by NyPa international, a US based corporation have been introduced into Australia, North Africa, Spain and Central and South Africa for evaluation purposes.

Four varieties were introduced into WA in 1995. *Distichlis spicata* includes the varieties NyPa Forage™ grass which provides a high protein feed for ruminants, NyPa Turf™ and NyPa Reclamation Grass™. NyPa ‘Wild Wheat’™ (*Distichlis palmeri*) produces a non-gluten grain which could provide an alternative cereal for people with allergies to specific wheat proteins.

Biology

Distichlis are natives of the tidal zones of the Mexican Gulf and are adapted to high levels of salt and poorly drained conditions. Thus being adapted for intertidal living the plants will withstand salt concentrations up to ~ 1.3 times seawater. However, they will grow the most at lower salt concentrations. The properties which allow *Distichlis* to persist in such harsh environments include:

Perennial: needs planting only once to produce a dense year round cover.

Rhizomaceous: grows and spread dominantly through its root system. The strong rhizomes have been observed to break through hardsetting surfaces to propagate new plants. Fibrous roots can spread densely in the top 50 cm of soil and as deep as 150 cm opening the soil to allow leaching. The ability of roots to persist in waterlogged conditions is due to *aerenchyma* tissue, hollow ‘tubes’ that allow gas diffusion to the roots in anaerobic conditions.

Euryhalic: as a true halophyte, *Distichlis* tolerates a wide range of salinities. Unlike other halophytes which accumulate salt in vascular cells, *Distichlis* exudes salt through bi-cellular salt glands, which then blows away or drops on the ground.

Eurythermic: tolerates a wide range of temperatures, however due to its C4 physiology, production is greatest at high temperatures (30° - 50°).

Establishment

Only the grain variety (NyPa ‘Wild Wheat’) produces viable seed and other varieties must be vegetatively propagated from the stolon-like root systems. Establishment

remains the biggest impediment to broad scale planting. Some success has been achieved on a Wickepin farm using a broccoli planter but it was slow and labour intensive. The use of a one-way plough to cover stolons spread with a fertiliser spreader showed encouraging results and warrants further research.

Case Study: Severely affected saline land east of Wickepin

Distichlis had been established on several areas of the farm, under agreement from NyPa International (owner of the breeder's rights) and Elders Australia (owner of the marketing rights). The four varieties growing on the farm include NyPa Forage, NyPa 'Wild Wheat', NyPa Turf and NyPa Reclamation. NyPa Forage has been the most successful and 12 hectares has now been established, including some of the most severely salt scalded hardpan areas where it is spreading and providing grazing for sheep.

NyPa Forage has established successfully on sandy duplex, loamy duplex and clay soils. Establishment was fastest in the sandy surface soils, where it had a rehabilitating effect on soil structure. Fibrous roots have spread densely through the top 50 cm layer of soil and had penetrated semi-solid hardpan. Establishment of NyPa forage was particularly good in areas where a shallow watertable was present. The watertable below NyPa forage had been lowered approximately 25 cm compared to adjacent saltland.

In terms of grazing value, indications suggest NyPa Forage is palatable to stock. It contains virtually no salt and has protein levels of up to around 16%, particularly when fertilised correctly. NyPa Forage was responsive to nitrogen and potassium fertilisers.

As the plants are C4's they produce most strongly in the summer where they have their roots in saline groundwater, thus they produce green feed when little else is organically active except in the presence of irrigation.

Cost Involved

Establishment cost is likely to be high due to the need for vegetative propagation. Since the plants are perennial, replanting costs will be minimal and this is likely to be particularly advantageous with the grain which competes with annual crops.

Weed potential

As the plants propagate at a rate of about 1 metre per year through their root system the plants are not held to be a weed risk. The plants are not very tolerant of competition and experience shows that conventional 'fresh water' plants recolonise areas where *Distichlis* has lowered the water table.

Further Research

Preliminary observations of the performance of the NyPa *Distichlis* cultivars in the Western Australian wheatbelt suggest that it has sufficient potential to warrant further research. Methods of establishment should be investigated to decrease the costs

involved. It would be useful to explore changes in soil physical characteristics, pH range and the profile characteristics that the grass deals with, particularly hardpans. Grazing potential and animal production from NyPa Forage and NyPa 'Wild Wheat' is another area of research which could potentially positively benefit grazing enterprises on saline land. Nutritional and digestibility studies in addition to investigating grazing methods would provide important tools in how to manage *Distichlis* in WA conditions.

References Used

1. Raymond Matthews, personal communication
2. John Leake, personal communication
3. 1999 PURSL Conference Paper 'The Place of *Distichlis sp.* in the Saline Landscape'

Further Information

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