PROGRESS REPORT - FLOWERING AND SEEDING OF SPINIFEX

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INTRODUCTION

The proportion of sound seed within spinifex seedheads is often low and tends to vary considerably between locations and years. Collections from a number of North Island sites over several years have often produced little or no sound seed. This has implications for the restoration of bare sites with spinifex where techniques are being developed to either plant nursery-raised seedlings or sow seed directly on dunes. Extraction of formed seed from seedheads for sowing in the nursery is a promising technique for raising large numbers of spinifex seedlings. However, extraction is a very slow, labour intensive process, and hence expensive, particularly when the seedheads contain very few sound seed. This project aims to determine which factors affect the production of formed seed and eventually to provide managers and Coast Care groups with practical information and guidelines for the collection of seedheads with a reasonable proportion of formed seed for revegetation purposes.

WORK PROGRESS

Progress has been made on several aspects including:

- Maintain and update the database on seed collection and germination spanning the last 5 years.
- Collection of 1999 seed from several North Island locations; determine proportion of formed seed and add to database.
- Monitoring pollination time; photographing male and female flower development on an east and west coast site of the North Island.
- Compiling a comprehensive bibliography on the flowering and seeding of spinifex including papers, articles and books from both Australia and New Zealand.
- Carrying out a rapid survey of spinifex male and female colonies, site factors and spinifex stand characteristics on several east coast North Island sites.
- Attendance at Seed Symposium 99, Massey University, College of Sciences, February 1999; ongoing discussions with seed scientists and seed testing laboratory staff.
- In collaboration with local Beach Care groups and locals, initiation of planning and establishment of trials at two Coromandel beaches to monitor flower and seedhead development in treated and control sites.

RAPID SURVEY SPINIFEX TRIAL

Rationale

A rapid survey of spinifex stands was undertaken on a large number of sites along Papamoa and two Coromandel beaches. The aim was to determine if there are any broad correlations between the proportion of formed seed found in seedheads, and major site factors and stand characteristics using a sample of seedheads collected at each site. This would provide indications of factors likely to be implicated in seed formation, and assist in the planning of a more intensive study.

Method

Seed collections were taken from a wide range of sites along each beach. The survey was undertaken in late January while all seedheads were attached to parent plants. Seed begins to detach from parent plants in early February along the Bay of Plenty coast.

Female spinifex colonies identified by a cluster of seedheads were located along the foredune of each beach. Up to 50 seedheads were collected at random from the female colony. A number of site and spinifex stand factors were recorded:

- Size of the female colony (3 size categories)
- Width of spinifex zone from high water mark to the boundary between the spinifex dominated foredune and reardunes dominated by other vegetation.
- Average height of spinifex foliage in the vicinity of the seed collection site.
- Distance of mid-point of female colony from high water mark.
- A subjective assessment of the seeding vigour of female colony in terms of relative density of seedheads (5 categories).
- Distance to up to 5 closest male colonies within a 50 m radius.
- Direction to each male colony.
- A subjective assessment of flowerhead vigour for each male colony based on presence/absence of smut and density of flowerheads (5 categories).
- Size of each male colony (3 categories).
- Grid reference of seed collection site.

Fertilised and non-fertilised sections of Papamoa Beach were sampled. Sampling was carried out at a total of 30 sites at Papamoa and 8 sites at each of Matarangi Beach and Tairua Beach.

Seed collected at each site is currently being assessed for the proportion of formed seed in each seedhead. This is carried out by carefully pulling the seedhead apart and pressing the base of each spine between the thumb and forefinger where the seed is enclosed. A spine with a swollen base contains a formed seed.

Interim Results

To date seedheads from less than half of the female colonies surveyed have been processed. The proportion of formed seed in the Papamoa seed collections assessed are relatively high compared to collections made in previous years. The proportion ranges from 15-68% of spikelets in a seedhead with formed seed. Preliminary analysis of this data indicates that two closely related factors are significantly correlated to proportion of formed seed in seed collections (Table 1; Fig 1). Seedheads collected from female colonies that had a male flowering plant nearby had a significantly higher proportion of formed seed than females located at greater distances from flowering males. Generally the greatest proportion of formed seed in seedheads was found where seedheads were collected from female colonies that were within 2 m of a male plant. Similarly, the greater the number of male colonies in the vicinity of a female colony, the higher the proportion of formed seed within that colony. At this stage no other stand or site characteristics had significant correlations with seed formation.

Table 1: ***Correlation coefficient between percentage of formed seed of each female colony and the site/spinifex stand factors.***

Factor	Formed Seed
Size of female colony	-0.13
Width of spinifex zone	-0.02
Height of spinifex vegetation	0.03
Distance to seaward edge	0.10
Female vigour	0.34
Distance to nearest male plant	-0.52*
Male vigour	0.23
Size of male colony	0.11
Number of male colonies	0.50*

* Significant at p = 0.05

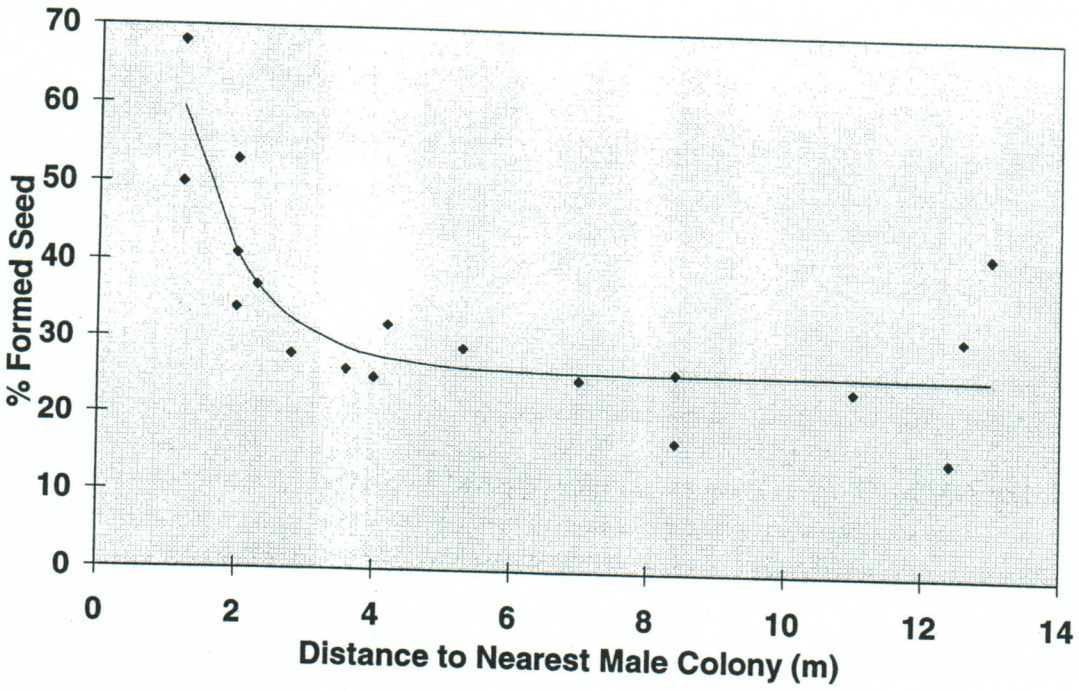

Figure 1: ***Percentage of formed seed found in female colony and distance to the nearest flowering male colony.***

Although it is too early to draw firm conclusions from this partial data set, these interim results suggest that proximity of male and female plants may be an important factor in determining the formation of seed in spinifex.

Once all seed collections have been processed and data analysed, factors that appear to be influencing seed formation will be investigated further. In addition, all separated formed seed will be included in a germination test to determine the proportion of viable seed in formed seed.

PRIORITIES FOR THIS PROJECT

This project will continue with CDVN and FRST support for at a further 3 years. Priorities for research will include:

- Completion of the rapid survey - seed sorting, data analysis, determining significance of correlations with key site/stand factors.
- Initiation of intensive studies on factors affecting seed formation based on results of the survey.
- Undertaking seed testing using standard techniques involving laboratories in Palmerston North.
- Continuing to evaluate seed formation from seedhead collections from fertilised and non-fertilised sections of dunes.
- An evaluation of the effect of smut on seed formation on beaches with and without the presence of the floral smut.
- Establishing trials on at least two sites evaluating a range of fungal treatments to eliminate smut.
- Testing the effect of other nutrients on plant nutrition and seed formation.