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File Note

FRI, Rotorua

**PERFORMANCE OF PINGAO
PLANTING TRIALS AT WHAINGAROA
EIGHT MONTHS AFTER PLANTING**

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INTRODUCTION

Pingao planting trials were established on two west coast beaches of the North Island to complement planting trials already established on the east coast (refer to Herbert & Bergin (1991a) for details on east coast trials). An evaluation of the more exposed west coast beaches was considered necessary to determine the potential for establishing nursery-raised pingao seedlings on such sites. Two west coast sites were selected; one site was located in Whaingaroa Harbour (Raglan) and the other near the Whangaehu River mouth near Whanganui. Details of the west coast phase of trials is given in Bergin & Herbert (1991b).

The planting trial located at Whaingaroa Harbour (Raglan) was assessed 8 months after planting. The performance since planting of planted pingao seedlings at this site is detailed in this report.

BACKGROUND

The Whaingaroa Harbour trial area is located at Wainamu Beach on the south side of the harbour approximately 800 m from the entrance (Fig. 1). The dune system is 50-70 m wide and is

relatively flat but becomes more undulating with dunes furthest from the foreshore. The predominant species are spinifex (*Spinifex sericeus*) and some marram grass (*Ammophila arenaria*), with most of the latter removed from the vicinity of the trial site by hand pulling and burning immediately before planting. Pingao planting covered approximately a 200 x 20 m area just above the high water strand line. The planting site was fenced off before planting to deter recreational uses from trampling seedlings. The trial was planted in late August 1991.

METHODS

Trial design

Two blocks containing 12 plots each were located on the bare foredune. A total of 24 plots were planted with 20 pingao seedlings in each plot. Each plot had a single treatment applied to it. Treatments tested included stock provenances, with and without fertiliser, and with and without hydrogel. Plots were identified at the site by a numbered 50x25 mm treated wooden picket placed centrally within each plot. Seedlings were planted within a 2 m diameter circle about the central picket with an average spacing of 50 cm between plants.

Seedling type

There were two seedling types tested:

1. Wanganui seedlings raised in PB 3/4's ex Matawhero Nursery - large seedlings but with yellow foliage and roots often poorly attached to potting mix.
2. Whatipu seedlings raised in Tinus roottrainers ex Tairawhiti Polytechnic Nursery, Gisborne - small but healthy vigorous plants with bright green foliage.

Hydrogel treatment

Half of the seedlings were planted with hydrogel Broadleaf P4 using the recommended application technique of mixing dry granules into the planting pit while planting the seedling. Approximately 4 gm of hydrogel was applied to each seedling spread around the mid to upper root zone.

Fertiliser treatment

One-third of the plots were fertilised at planting with 25 g of Magamp (medium), a further third fertilised with 50 g Magamp and the remainder left unfertilised. Fertiliser was spread around the root system and mixed into the sand as the seedling was planted.

Seedling assessment

All seedlings were assessed for a range of factors in April 1992. The parameters included pulled up height measurement of a sample of seedlings in each group; a count of surviving plants and seedlings with multiple shoots; subjective assessments of seedlings health (one of 3 categories - good, intermediate, poor) and foliage colour (green, green-yellow, yellow); degree of sand movement since planting assessed by remeasuring the exposed portion of the central picket; noting number of plants browsed and number of plants in each group with seed heads; and finally, a subjective assessment of the percentage cover of sand area in each planted group covered by pingao seedlings (one of 4 categories - 0-25%, 26-50%, 51-75%, 76-100%).

Data Analysis

Analysis of variance methods were used to test the significance of the experimental design factors (seedling type, fertiliser and hydrogel) on seedling survival, growth, health and colour.

RESULTS

Height growth

There was a highly significant difference in height growth ($p < 0.01$) between the 2 seedling types. Whatipu pingao averaged almost 80 cm high 8 months after planting compared to Whanganui seedlings at 52 cm. From a sample of height measurements of pingao seedlings before planting, the better quality Whatipu seedlings averaged 50 cm high at planting compared to the taller but less vigorous Whanganui stock which had an average height of 60 cm before planting. Whatipu seedlings have therefore grown on average 30 cm in height since planting.

Fertiliser applied at planting had a significant beneficial effect on height growth of pingao ($p < 0.05$). Seedlings fertilised with 30 g and 60 g of Magamp were 74 and 71 cm high respectively 8 months after planting compared to 52 cm for unfertilised pingao.

Survival

There was a significant difference in survival between seedling types and fertiliser ($p < 0.01$). Whatipu seedlings performed better than Whanganui pingao. Both rates of fertiliser boosted growth of pingao compared with unfertilised seedlings (Fig. 2). As for height growth, there was no significant effect of hydrogel on survival.

Multiple leaders

There considerable differences in numbers of seedlings with multiple leaders between seedling types ($p < 0.05$), and particularly where fertiliser had been applied ($p < 0.01$). An application of 30 g of fertiliser at planting had boosted number of seedlings with multiple shoots by almost 5 times that of unfertilised seedlings for both Whatipu and Whanganui pingao (Fig. 3). Application of a 60 g of fertiliser did not increase seedling vigour compared to 30 g of fertiliser. These preliminary results however.

indicate that a double dose of fertiliser may not be as beneficial as the single rate.

Seedling health and foliage colour

There are highly significant differences in subjective assessments of both seedling health and foliage colour ($p < 0.01$). Whatipu seedlings were healthier and had greener foliage compared to Whanganui pingao. Fertilised seedlings also scored better for health and colour.

Sand movement

The larger Whatipu pingao had significantly less depletion of substrate (-1.4 cm) compared with the Whanganui seedlings (-10.5 cm) ($p < 0.01$). There was no difference in sand movement between control plots and those that had fertiliser or hydrogel applied at planting.

Browsing and flowering

Only a handful of plants had been browsed or had flower heads and these were not related to any planting treatments.

Percentage cover

Percentage cover of vegetation of each plot showed a marginal difference between seedling types with nearly 75% of Whatipu plots covered with foliage compared with less than 50% cover for Whanganui. Both rates of fertiliser however, increased foliage cover significantly ($p < 0.01$) with over 60% and less than 25% cover for fertilised and unfertilised plots respectively.

DISCUSSION

Most parameters used to assess performance of pingao planted on dunelands used in this trial indicated significant differences in growth rates of the two seedling types used. These differences are

related to differences in seedlings quality rather than any provenance variation. Although the Whatipu seedlings were smaller, they were more healthy and robust compared to the Whanganui seedlings which had yellow foliage and upper parts of root systems often exposed (Bergin & Herbert 1991b). Clearly, good quality seedlings which appear healthy and vigorous are preferable for planting than unhealthy stock even if the latter has longer leaves and larger stem diameters.

Most parameters also showed a major boost to performance of pingao that had been fertilised at planting compared with unfertilised seedlings. The near 5-fold increase in multiple leaders for fertilised pingao compared with unfertilised plants provides clear evidence of the beneficial use that fertilisers can have with establishing pingao on dunelands. The response to fertiliser of pingao planted on this west coast site has been for greater than the response to fertiliser applied to pingao planted on the east coast (Herbert & Bergin 1991) and may suggest a greater nutrient deficiency of sandunes on the west coast compared with the east coast. However, further research is required to determine any major nutrient deficiencies between west coast and east coast beaches.

Of interest is the possible deleterious effect of applying a double rate of fertiliser. 60 g of fertiliser may be burning root systems and therefore affecting performance of planted pingao but this would require further investigation to confirm this. There could also be further research on other types of fertiliser (e.g., fast acting formulations), rates of fertiliser applications and the effects and methods of post-planting fertiliser applications.

As with earlier FRI planting trials, hydrogel does not appear to have had any beneficial effect on growth of planted pingao.

Measurement of substrate levels indicate that the Whaingaroa site has been depleted of sand since planting. Although only 8 months since planting, this trial has demonstrated that where good quality seedlings are planted and where fertilisers are applied, there can

be a significant decrease in depletion of sand from exposed foredunes where pingao is established.

ACKNOWLEDGMENTS

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REFERENCE

- Bergin, D. O. ; Herbert, J. W. 1991a: Experimental rehabilitation of dunelands with pingao on the West Coast, North Island. Extension to FRI Work Plan No. 1999. 9p.
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- Herbert, J. W. ; Bergin, D. O. 1991: Experimental rehabilitation of dunelands with pingao. FRI Contract Report: FWE 91/93, 15p.

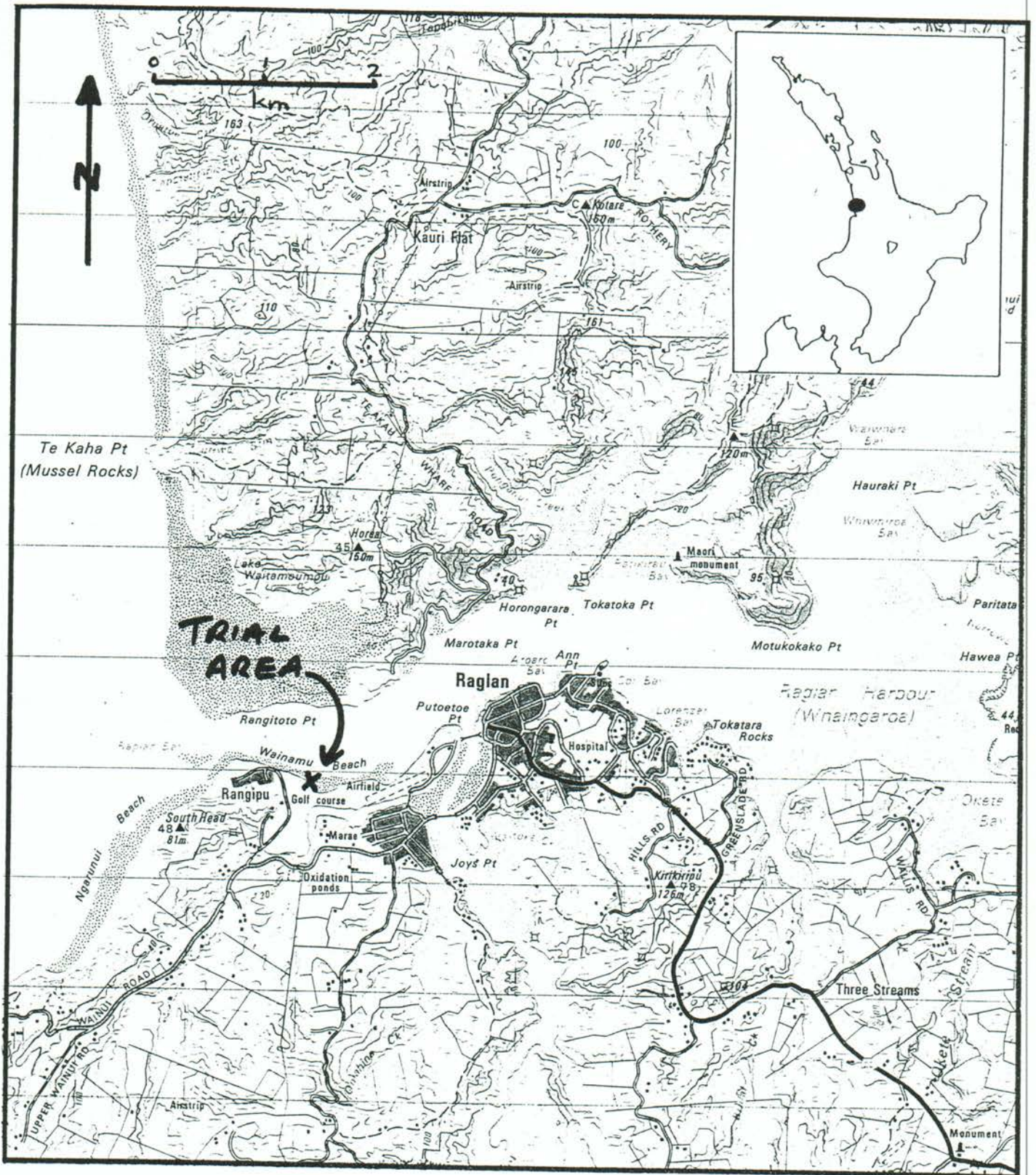


Figure 1: Location of pingao planting trial, Whaingaroa Harbour (Raglan)

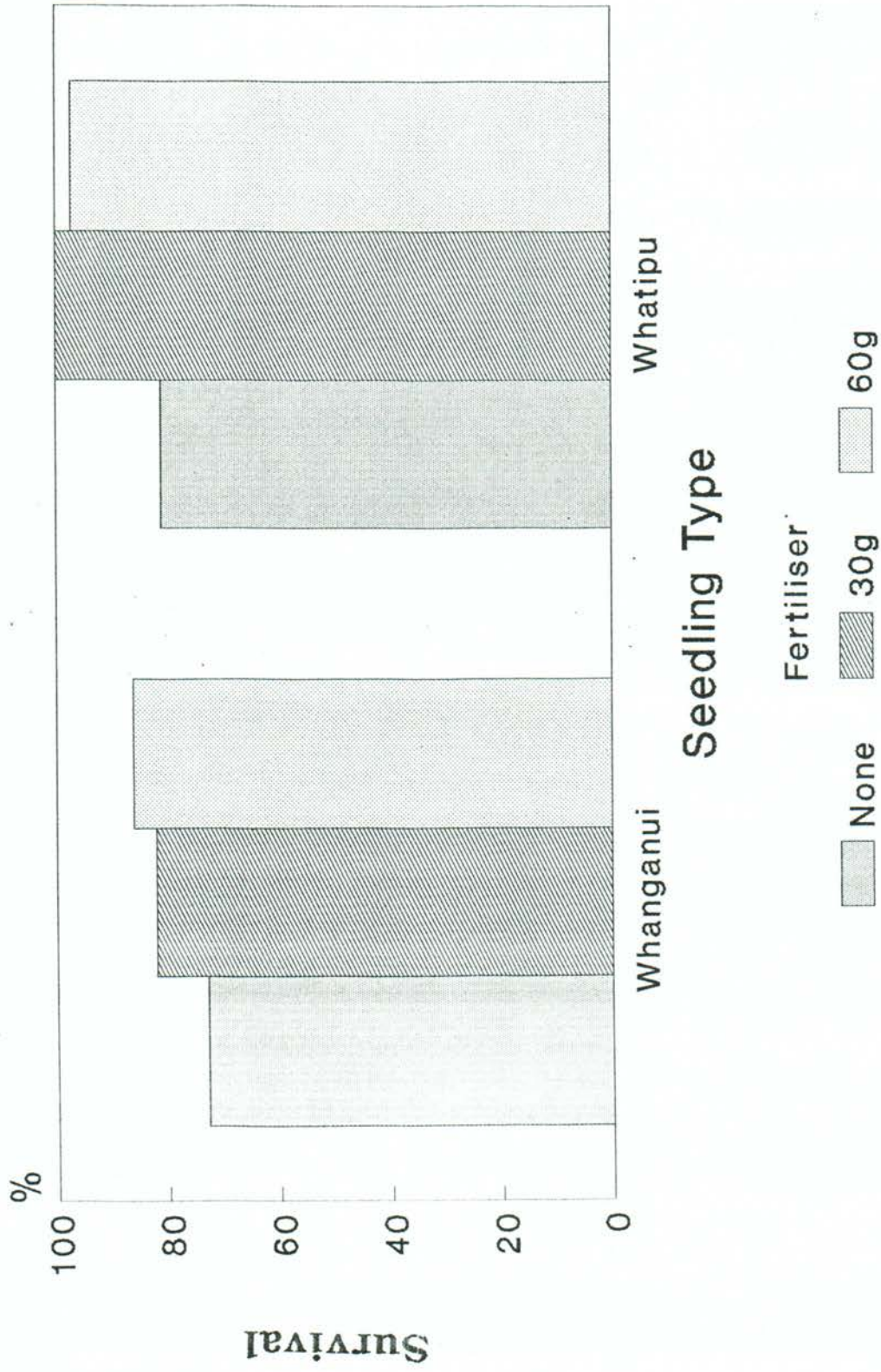


Figure 2: Percentage survival of pingao seedlings 8 months after planting at Whaingaroa Harbour for 2 seedling types with and without 2 rates of fertiliser.

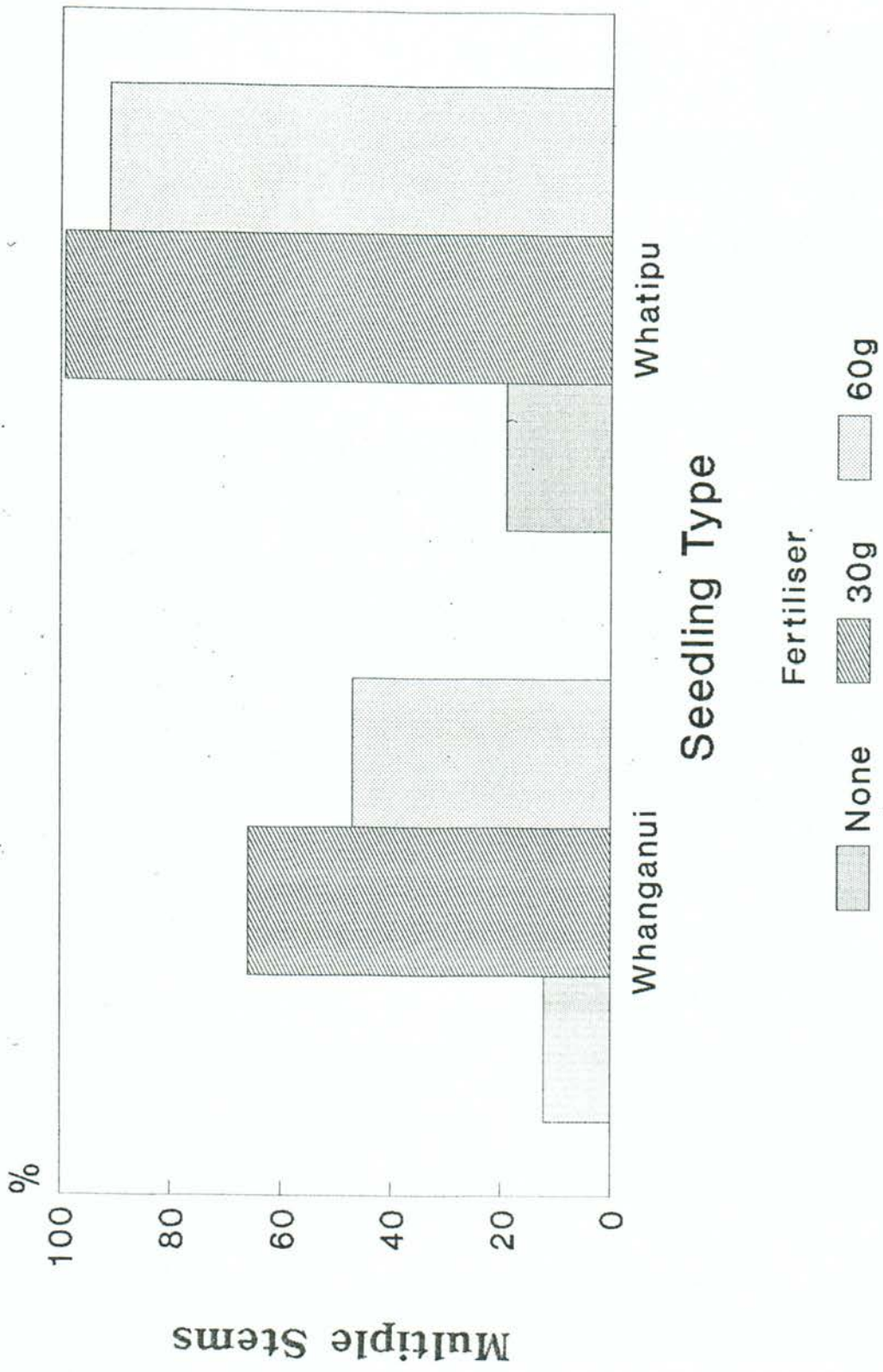


Figure 3: Percentage multiple stems of pingao seedlings 8 months after planting at Whanganui Harbour for 2 seedling types with and without 2 rates of fertiliser.