Project No. 1837

PHOSPHATE ROCK TRIALS ON THE WEST COAST OF THE SOUTH ISLAND OF NEW ZEALAND

by

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EXECUTIVE SUMMARY

On V-bladed "pakihi" soils on the West Coast of the South Island, phosphate rock is a suitable source of plant available P.

* there is some evidence that applying PR before V-blading (fertiliser/soil mixing) is better than surface application.

* there appears to be little difference in effectiveness between Christmas/Nauru and North Carolina PR's.

* useful height gains in the early years can be achieved with a starter dose of N alone.

* potassium is likely to be the next nutrient most limiting growth.

EARLY WORK WITH PHOSPHATE ROCK IN WESTLAND

INTRODUCTION

A series of co-operative trials were established between the FRI and Industry to examine the potential of rockphosphate as a broardcast fertiliser at establishment. The trials were set out in Northland, Auckland, Wellington, Nelson and Westland to cover a range of soil and climatic conditions. This report covers results to age four (1987) for WD398. Information on other trials in this series are contained in Reports 14, 19 and 20 of the National Forest Fertilising Cooperative.

MATERIALS AND METHODS

The Site
Nemona Forest Cpt 59
Rootraked, March 1983

The Trial WD398

Objective: To test rockphosphate (100kg P/ha) applied as a broardcast fertiliser:

(i) prior to V-blading
(ii) after V-blading

Design: Split plot factorial (4 blocks)

Main plots
1. control
2. rock P application before V-blade
3. rock P application after B-blade

Sub-plots
1. control
2. 100g pellet soluble fertiliser/tree

Refertilisation: In 1986 at age 3, each subplot was split across the two 10 tree rows, and one half received 90,100,100 kg/ha of N,P,K.

RESULTS at age 4 (1987)

1. Growth

Trees fertilised with the DAP mix at establishment showed the best height and collar diameter growth (Fig.1) at 3.2 metres and 93 mm respectively. Where PR was incorporated into V-bladed mounds trees were comparable with the DAP treated trees. Where PR was aplied after V-blading, height growth was about 1/3 of a metre less.

2. Nutrition

The effect of nutrient treatment on foliar P concentrations to age 4 are

Refert	Control -st	Control +st	PR "before' -st	PR "before' +st	PR "after" -st	PR "after" +st
			%P			
No	.09	.11	.14	.15	.11	.13
Yes	.16	.15	.15	.15	.18	.15

Potassium concentrations ranged between 0.6% (not refertilised) and 0.7% (refertilised). Nitrogen concentrations were between 1.4 and 1.5%.

Apart from those trees not fertilised at establishment, foliar N,P and K values were above critical levels prior to the application of soluble NPK fertiliser at age 3. The lack of a fertiliser response is therefore not surprising, and indicates that, at least to age 4, trees treated with PR can maintain adequate foliar nutrition.

PHOSPHATE ROCK RATES TRIAL IN WESTLAND

INTRODUCTION

Recent work with rockphosphate as a broadcast fertiliser for radiata pine at time of planting on P-deficient soils has shown satisfactory foliar P levels for the first seven growing seasons. Rockphosphate in these experiments was applied at a rate of 1 tonne/ha (about 140kg P/ha). This rate may be higher than optimum. In 1982 a series of "rates" type trials were established through Northland, Auckland, Wellington, Nelson and the West Coast. The aim was to define the minimum quantity of P as phosphate rock (PR) to maintain tree growth during the early years. This report describes work on the West Coast.

MATERIALS AND METHODS

The Site
Cpt 35 Nemona Forest
Sprayed and burnt, March 1984
Rootraked, May 1985
Second rotation

TRIAL (WD403/1)
Objective: To define the minimum quantity of P as broadcast rockphosphate required at establishment for good early growth.

Design: Randomised block design (3 blocks)

Treatments
1. control
2. 56kg P/ha (Xmas/Nauru)
3. 125 " "
4. 280 " "
5. 125 " " (Nth Carolina)

Sub-treatments
1. no starter
2. starter (80g DAP/tree)

Refertilisation
1. no refert
2. refertilise with 90,100,100 kg/ha N,P,K

TRIAL (WD403/2)

Objective: To assess the effect of a "starter" of N and P after the application of 125kg/ha of P as broadcast rockphosphate on the early growth of radiata pine.

Design: Randomised block design (3 blocks)

Treatments
1. 125kg P/ha (Xmas/Nauru)
2. 125 " (Nth Carolina)

Sub-treatments
1. no starter
2. N (15.6g UREA/tree)
3. P (40.0g TRIPLE SUPER/tree)
4. N+P (as above)

RESULTS

TRIAL WD403/1

1. Growth

By age 3 years, and in the absence of DAP as a "starter" fertiliser, the response to PR had essentially reached a plateau at about 56 kg P/ha (Fig.2). An application of 80 g DAP at establishment improved growth slightly over the PR treatments, and indicates an early need for soluble N.

2. Nutrition

The effect of PR at or above 56 kg P/ha was to maintain foliar P in excess of 0.12% (see table below). Although DAP treated trees showed the best response by age 3, foliar P had already declined to 0.09%; growth rates are expected to decline for this treatment relative to the PR treatments. Potassium levels were marginal in all treatments (0.4-0.5%) and nitrogen

	P rate (kg P/ha)				
	0	56	125	280	125*
%P	.09	.12	.14	.17	15
%N	1.7	1.4	1.5	1.4	1.4

*125 is North Carolina at 125 kg Pha

TRIAL WD 403/2

1 Growth

This trial compared the additional growth with N, P & NP for trees established in V-bladed rounds fertilized with either Christmas/Nauru or a North Carolina PR at 125 kg P/ha.

The results per height growth (below) show a significant 1/3 of a metre increase in height growth where N was applied as a "starter" fertilizer. There was no advantage in using either P, or NP as the "starter" fertilizer.

N	No		Yes	
P	No	Yes	No	Yes
	....hts (cm).....			
Xmas/Nauru	236	261	277	274
N. Carolina	278	275	287	311

2 Nutrition

In the absence of starter fertilizer trees established with both PR types had foliar P concentration 0.12 - 0.13%. Where N had been the starter fertilizer, the foliar P concentration was further improved to 0.14%, presumably through expanded root growth.

Fig 1 a

THE EFFECT OF FERTILISER TREATMENT ON HEIGHT GROWTH
TRIAL WD398
AGE 4

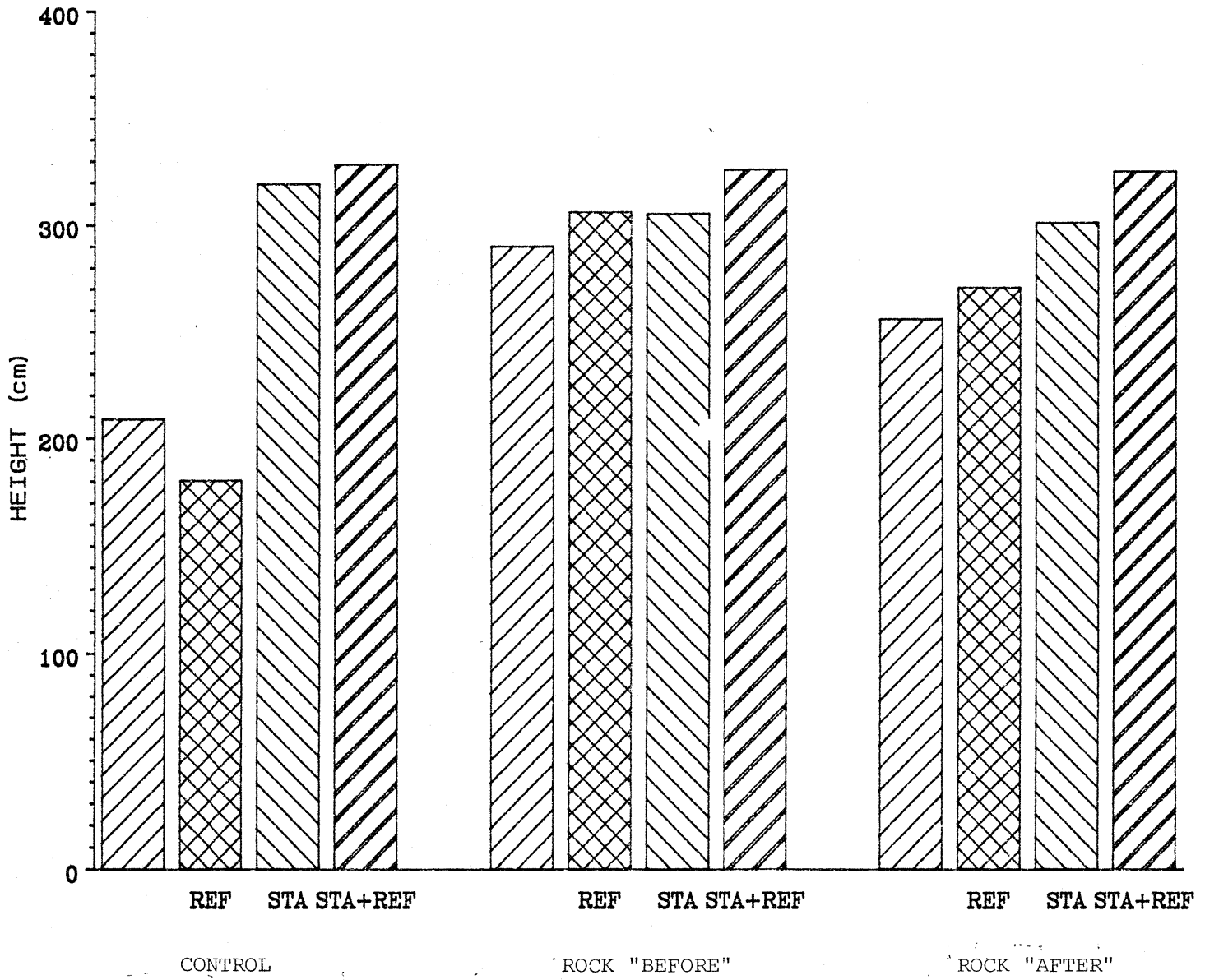

Fig 1 b THE EFFECT OF FERTILISER TREATMENT ON DIAMETER GROWTH
TRIAL WD398
AGE 4

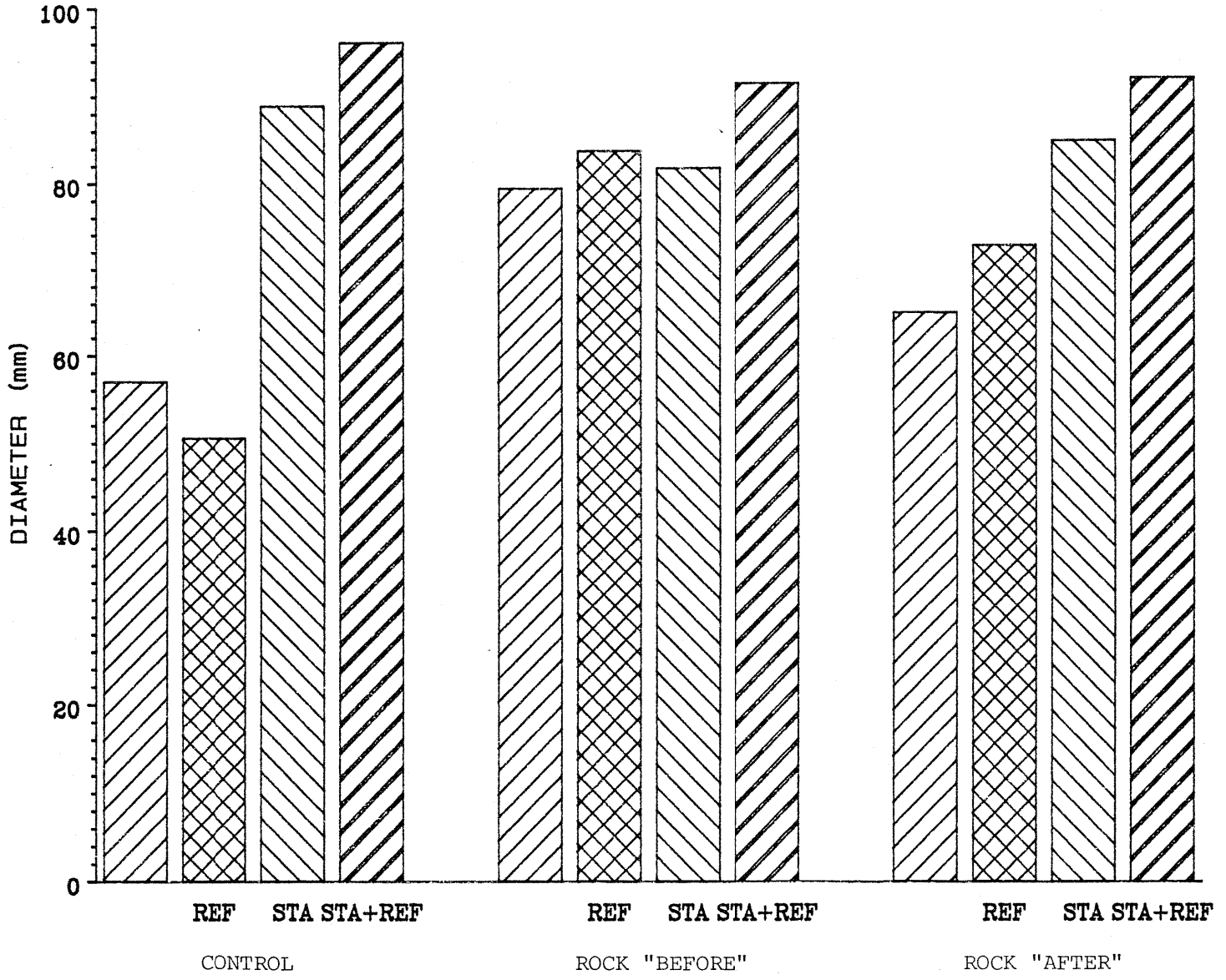

Fig 2 a

THE EFFECT OF FERTILISER TREATMENT ON HEIGHT GROWTH
TRIAL WD403/1
AGE 3

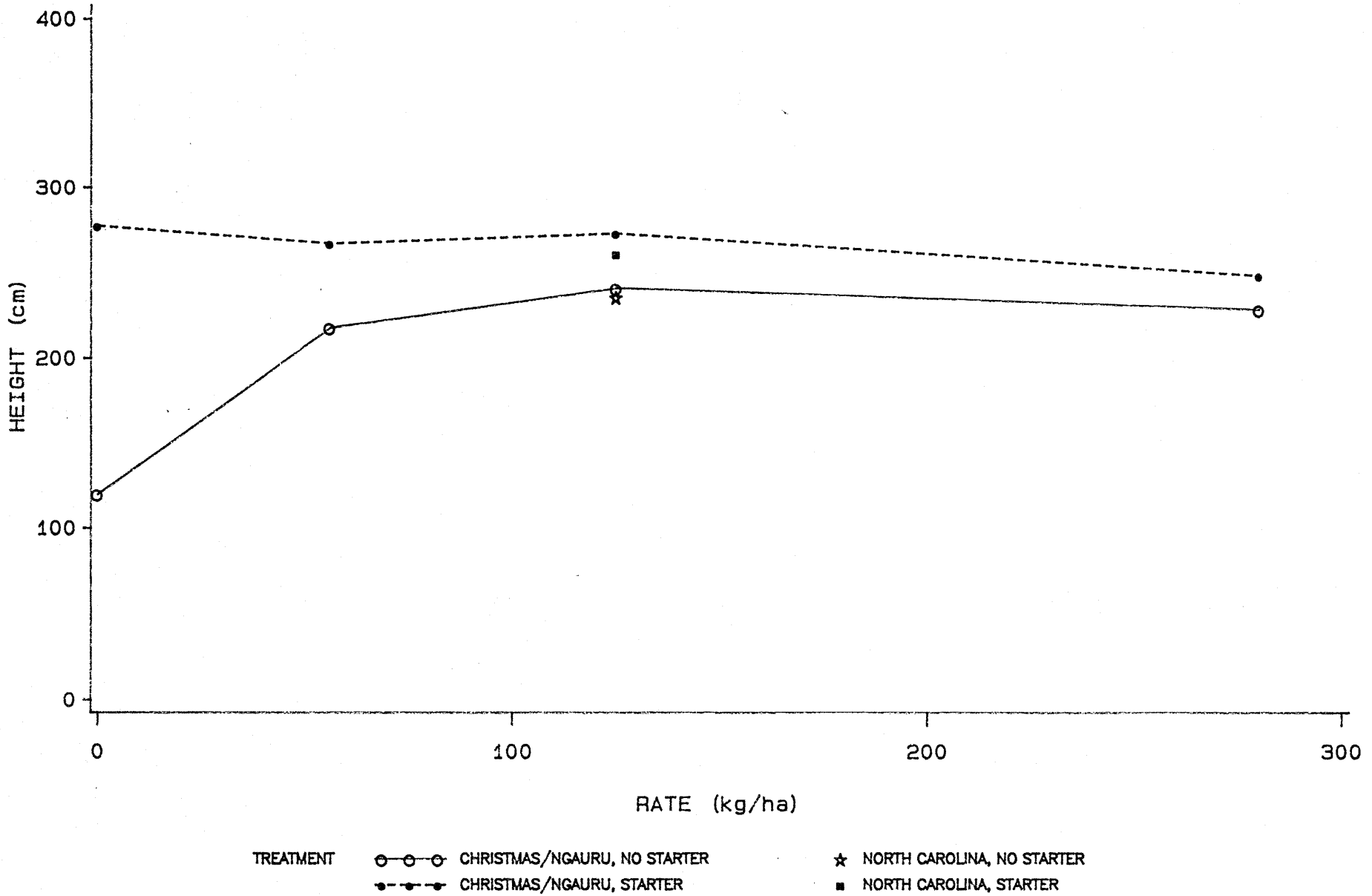

Fig 2 b

THE EFFECT OF FERTILISER TREATMENT ON DIAMETER GROWTH
TRIAL WD403/1
AGE 3