

PEANUTS — A POSSIBLE CROP FOR WARM NORTHERN AREAS OF NEW ZEALAND

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ABSTRACT

Trials with peanuts at Pukekohe and in Northland have shown some promise. The better cultivars yielded over 2.5 t/ha of shelled nuts at favourable sites. It is considered that peanuts may have a potential as a crop in warmer northern areas of New Zealand.

Additional Key Words: cultivar, site, sowing date.

INTRODUCTION

Peanuts originated in South America and are grown throughout the warm temperate and tropical regions of the world. World production of shelled peanuts was over 12 million tonnes in 1970 (Woodroof, 1973). Efforts are being made to expand peanut production into cooler temperate regions such as Southern Ontario, Canada (Anon., 1979).

Peanuts have been grown by home gardeners in various parts of New Zealand for many years, although trials (N.Z. Dept. of Agriculture, 1967/68) indicated that only the northern areas of New Zealand would be suitable for commercial production. Field scale trials at Dargaville (Dawbin, 1980) and Helensville (C.A Farrell pers. comm.) were disappointing, because of poor plant growth, inadequate weed control, and disease. In hindsight, the choice of only two cultivars, and unsatisfactory site selection and cultural practices also help to explain the poor results.

New Zealand imports almost 5,000 tonnes of peanuts a year at a landed cost of over \$1,000 per tonne, and 200,000 litres of peanut oil at \$1.30 per litre.

This paper describes trials investigating the feasibility of producing peanuts in northern New Zealand.

MATERIALS AND METHODS

Initial Screening Trials

Seventy three peanut lines were obtained from the University of Guelph, Canada (3), the USDA (8) and the Department of Agriculture, Western Australia (62). These were sown in single 3 m rows at the DSIR Pukekohe Research Station in late November, 1978 and harvested in early May, 1979. Forty two of the lines were retained for further evaluation.

These lines were grown at four sites in 1979/80: Te Hapua in the far north (Rangiuru clay), Dargaville (Te Kopuru sand), Otakanini near Helensville (Whananaki

TABLE 1: The performance of peanuts in trials, 1979/80.

	Te Hapua	Pukekohe	Dargaville	Otakanini Single Rows	Otakanini Replicated Trial
Sowing date	31/10	28/11	28/11	4/12	4/12
No. of cultivars tested	42	42	32	31	16
Mean nut yield kg/ha	2420	75	630	510	540
No. of cultivars retained for 1980/81	12	12	9	7	8
Mean yield of retained cultivars kg/ha	3030	145	970	1020	720*
Harvest date	1/4	14/4	11-16/4	17/4	17/4

*CV% 46.5

sand), and Pukekohe (Patumahoe clay loam). At each site, a single 3 m row of 40 seeds of each cultivar was sown, at either 50 cm or 75 cm row spacing. In addition, a 3 replicate trial of 16 cultivars, with 3 m x 2 row plots of 80 seeds, was sown at Otakanini.

There was sufficient seed for only 32 lines to be sown at Dargaville. All lines were sown at Otakanini, but only five were in both trials at this site. Sowing and harvest dates are shown in Table 1.

1980/81 Trial

Twelve cultivars selected from the 1979/80 trials were planted in factorial experiments at three sites: Kerikeri (Okaihau gravelly clay), Otakanini, and Dargaville; with two sowing times: (3-4 November and 24-25 November). Cultivars and sowing dates were completely randomized within the three replicates. The 3 m x 2 row plots had a 50 cm row spacing.

Seed was inoculated with the appropriate *Rhizobium* and approximately 80 seeds were sown per plot. Each site received 600 kg/ha of 6:6:5 fertilizer at sowing. Weed control at all sites was by a pre-emergence spray with alachlor (3kg a.i./ha), followed by hand weeding. The trial was harvested by fork over the period 30 March - 3 April. After drying, the shell weight of each plot was recorded. A subsample was then taken and shelled to calculate shelled peanut yield.

A trial of the same 12 cultivars was sown at Te Hapua on 1 November but was abandoned because of extremely poor germination.

RESULTS

Initial Screening Trials

Performance in the 1979/80 trials is summarised in Table 1.

Peanut yields were very high at Te Hapua, considerably lower at Dargaville and Otakanini, and extremely poor at Pukekohe.

1980/81 Trial

In the 1980/81 trial, a mean population exceeding 20 plants/m² was aimed for. However, the overall mean plant populations achieved were considerably below this, particularly at Otakanini; the mean harvest populations at Kerikeri, Dargaville and Otakanini were 13.3., 12.2., and 7.4 plants/m² respectively. There were also large differences in mean plant population between cultivars and there was a significant correlation over cultivars between mean shelled nut yield and harvest plant population. However, yields per plant were lower in plots with higher populations. The shelled nut yield was therefore corrected by covariance analysis.

The mean cultivar yields and plant populations are shown in Table 2. The covariance analysis has reduced the yield differences between cultivars but the same cultivars, particularly CPI 46724 and CPI 72442, stand out as having superior corrected and uncorrected yields. There was a statistically significant site x cultivar interaction ($P = 0.05$) but the cultivars with the highest yields performed well at all sites.

Table 3 shows the variation in time of sowing effects over the three sites. There was little difference between the Otakanini and Kerikeri trials in mean yield but these had almost double the yield of the Dargaville trial. However, when yields were corrected for plant population, the Otakanini site was significantly higher than Kerikeri ($P = 0.05$).

The early sowing led to a significantly higher mean peanut yield ($P = 0.05$). However, this increase was due almost entirely to the Kerikeri and Otakanini sites. When yields at Dargaville were corrected the later sowing date had the higher yield. This interaction between sites and sowing date was not significant for uncorrected yields but when yields were corrected the difference was highly significant. ($P = 0.01$).

TABLE 2: Mean cultivar plant populations and peanut yields 1980/81.

Cultivar	Plants/m ²	Nut Yield kg/ha	Corrected Nut Yield kg/ha
CPI 46724	13.7	2200	2100
CPI 72442	11.3	2060	2040
Valencia Senegal	10.9	1950	1960
Spanish White	11.4	1910	1890
New Mexico	11.8	1900	1860
EM 12	12.5	1890	1830
Hippragi	12.2	1870	1820
Florspan Florida	7.7	1610	1750
Valencia Rhodesia	10.1	1650	1690
Starr	11.8	1660	1620
CPI 39248	9.7	1450	1510
EC 5	8.8	1280	1360
LSD (0.05)	1.2	220	240
CV% site. rep. variety	11.7	13.1	12.8

TABLE 3: The effect of site and sowing date on peanut yields (kg/ha) 1980/81. Corrected yields in brackets.

Site	Sowing date			
	3—4 Nov		24—25 Nov	
Kerikeri	2310	(2220)	1900	(1490) 2100 (1850)
Dargaville	1120	(890)	1110	(1090) 1120 (990)
Otakanini	2500	(2770)	1770	(2260) 2140 (2520)

Site LSD (0.05) = 540 (610) CV% site. rep. = 15.1 (10.7)
 Sowing date LSD (0.05) = 300 CV% site. rep. sowing date = (110) 14.8 (4.9)
 Site x sowing date LSD (0.05) = (550) same site = (240)

DISCUSSION

The yields in the higher yielding trials, although coming from small, hand harvested plots were very encouraging. The cultivars retained at Te Hapua in 1979/80 had a mean peanut yield exceeding 3000 kg/ha (Table 1). The mean uncorrected yields of the five cultivars with the highest overall mean yields in 1980/81 were 2690 and 2560 kg/ha from the early sowings at Otakanini and Kerikeri respectively.

These yields compare favourably with a maximum peanut yield of 2537 kg/ha recorded by Roy *et al.* (1980) in trials in Ontario. However, higher field yields, up to 3100 kg/ha, have been recorded there (Anon., 1979). Woodroof (1973) reported a mean USA yield of 2300 kg/ha for 1970, with a maximum yield of 6160 kg/ha.

Roy *et al.* (1980) suggested an optimum plant population of 18-33 plants/m². The population in the 1980/81 trial was considerably below this and it is felt that higher yields could reasonably have been expected with increased plant population particularly at the low Otakanini site.

The emergence failure at Te Hapua in 1980/81 was disappointing after the very high yields in the first trial. Possible reasons for these high yields in 1979/80 include a sheltered site coupled with early sowing and a high standard of weed control. Roy *et al.* (1980) obtained no response to sowing date but other work (Cox *et al.*, 1976) showed lower yields with a delay in sowing. There was a worthwhile response to early sowing at Kerikeri and Otakanini. The lack of response at Dargaville can be explained by this site being the most exposed of the three. The site x sowing date interaction suggests, that for maximum yields, it is important to sow peanuts early. However, if soil temperatures are below the 15°C minimum for peanut growth, early sowing will give no yield increase.

The exposed nature of the Dargaville site is also likely to have contributed to the lower overall yields of that site compared with Otakanini and Kerikeri. The Pukekohe site used in 1979/80 was very exposed and this helps to explain the extremely poor yields obtained there.

Most peanut cultivars in these trials have been of the early maturing Spanish and Valencia types. Some later maturing Virginia lines were grown initially but were low yielding and none were retained beyond the 1979/80 trials. Of the five highest yielding lines (four not significantly below CPI 46724) in the 1980/81 trial, two (CPI 46724 and Spanish White) are Spanish types and three (CPI 72442, Valencia Senegal and New Mexico) are Valencia types. Other early maturing cultivars of the Spanish or Valencia types could be obtained for New Zealand but the present high yielding selections appear adequate for establishing the commercial feasibility of peanuts.

In general, peanuts have been considered better suited to lighter sandy soils but high yields were obtained in these

trials on both volcanic soils (Te Hapua, Kerikeri) and sands (Otakanini). Preliminary studies by Piggot and Honore (pers. comm.) suggests that herbicides can give good early weed control. Late germinating weeds are a problem which will be investigated further. Fungal disease, primarily *Sclerotinia*, has been present at all sites.

In conclusion, although there are clearly problems to be overcome before peanuts can be grown successfully on a commercial scale in New Zealand, they appear to be able to play some part in the diversification of agriculture in sheltered sites in the warmer northern areas of New Zealand.

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