Possibilities for production of South Pacific taro in New Zealand

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Abstract

The South Pacific taro cultivars Niue and Ni Tonga and the New Zealand cultivar RR were planted in spring and harvested 10-14 months later at two Auckland sites in the 1997-98 and 1998-99 seasons. At both sites the traditional South Pacific island planting density of 10,000 plants/ha was used. At harvest corms weighed from 800 to 1500 g, a similar range to corms imported to New Zealand from South Pacific island countries. The highest dry matter content of corms was 22%, much lower than the 30% or more dry matter content in corms grown in South Pacific island countries. Dry matter content differences among both cultivars and harvest times were not significant. The plants had probably reached a "premature maturity" when harvested and so a low corm dry matter content resulted. Whether a true maturity, and thus successful production, could be achieved in South Pacific taro cultivars in New Zealand is discussed.

Additional key words: *dry matter content, maturity*

Introduction

Taro (*Colocasia esculenta* (L.) Schott) is an ancient crop now grown widely throughout the tropics and subtropics, primarily in subsistence economies. World-wide there are many cultivars, each of which may be suited to distinct cultural practices, environmental conditions and uses. Taro is eaten mainly by Asians and Pacific Islanders in New Zealand. Japanese cultivars with small main corms (about 300 g weight) and many suckers have been grown successfully in New Zealand and suit Japanese tastes (Follett and Scheffer, 1996; Scheffer and Douglas, 1999). South Pacific cultivars with large main corms (about 1kg weight) and few suckers were grown to the desired size at numerous sites in the Auckland region in the 1996-97 season (Bussell and Goldsmith, 1998). However, reservations were expressed about the eating quality of the corms. Many Pacific Islanders considered these New Zealand grown corms to be too soft compared to island grown corms. During the past two seasons we have undertaken some further small scale trials on production of South Pacific taro cultivars. In this paper we report the results and discuss likely limitations to the production of these cultivars in New Zealand.

Materials and Methods

Trials were conducted at both UNITEC Institute of Technology, Mt Albert and Waipareira Trust, Massey in the 1997-98 season and at UNITEC only in the 1998-99 season. The three cultivars used were the South Pacific cultivars Niue and Ni Tonga and the most common New Zealand cultivar, termed variant RR by Matthews (1985). For the 1997-98 season trials cvs. Ni Tonga and RR were planted at UNITEC on 1 September 1997; and cvs. Niue, Ni Tonga and RR were planted at Waipareira Trust on 12 October 1997. The UNITEC trial had a split plot design with five replicates. The main plots were harvest times: four harvests at monthly intervals from mid July 1998 to mid October 1998. Sub-plots were cultivars consisting of three plants each. The Waipareira trial had a randomised block design with six replicates and each plot contained three plants. For the 1998-99 season trial cv Niue was planted on 24 September 1998 at UNITEC. The only treatment was four harvest times in a randomised block design with four replicates. Each plot contained three plants.

The planting material used in these trials was the largest we could obtain. It was either tops (headsett, tiapula) of main corms with a basal diameter of at least

60 mm or suckers with a maximum diameter of at least 60 mm. Establishment and cultural practices were the same as those used in the 1996-97 season (Bussell and Goldsmith, 1998). These practices included transplanting well rooted planting material in rows 1m apart, with plants 1m apart in the row (population 10,000 plants/ha, a common planting density in South Pacific island countries) and applying irrigation of about 60 mm/week from 15 November (when soils were starting to dry out) to 15 April (when leaf growth was noticeably slower, rainfall was increasing and evapotranspiration was decreasing). This amount of irrigation provided moisture at above the rate of 2500 mm/year necessary for good corm growth in tropical dryland (upland) conditions (Purseglove, 1972) during the time our trial crops were growing most vigorously. Conditions during a growing season in Auckland are drier and cooler (Table 1) than in the tropical South Pacific islands to the north of New Zealand.

Fertiliser (30 g/plant of both urea and muriate of potash) was applied and worked in just after transplanting. No P fertiliser was applied because prior soil tests indicated an adequate P level at both sites. Plots were weeded thoroughly by hand in late November and immediately covered with 0.1m of wood mulch. The mulch gave very good weed control throughout the season.

In the 1997-98 season harvesting was done once at Waipareira Trust, on 16 July 1998, and at monthly intervals at UNITEC between mid-July and mid-November 1998. The only harvest at Waipareira Trust and the first harvest at UNITEC were made when plants appeared to have reached maturity, as indicated by mature leaves senescing and tops of corms becoming slightly pointed. At each harvest all corms from each plot were weighed and dry matter percentage was determined from one corm from each plot. Dry matter determinations involved oven-drying just harvested diced corms at 70°C until constant weight was reached, usually after 96 h. In the 1998-99 season harvesting at UNITEC had been done only once, on 18 June 1999, before this paper was written. Maturity appeared to have just been reached then. At harvest all corms from each plot were weighed and dry matter percentage was determined from one corm from each plot.

Table 1. Monthly averages(1951-80) of mean air temperature, soil temperature and rainfall at Albert Park, Auckland City.

Month	Temperature (°C)		Rainfall (mm)
	Air	Soil (30cm)	
January	19.8	22.4	65
February	20.4	22.6	96
March	19.3	21.1	91
April	16.9	17.9	117
May	14.3	14.6	124
June	12.1	12.1	141
July	11.2	10.7	141
August	11.9	11.5	139
September	13.2	13.4	101
October	14.8	16.0	97
November	16.5	18.6	89
December	18.3	20.9	88

Results and Discussion

Corm weight in the 1997-98 season Waipareira Trust trial averaged 875 g. There were no significant differences ($P < 0.05$) in mean corm weight among the three cultivars in the trial. Corm weight in the 1997-98 season UNITEC trial averaged 1280 g. There were no significant differences ($P < 0.05$) at each harvest in mean corm weight between the two cultivars in the trial. There were also no significant differences ($P < 0.05$) in mean weights over the four harvest times. The average weight of corms harvested at UNITEC in June 1999 was 1210 g. The higher average corm weight at UNITEC suggests that its volcanic soil may be more suitable for growing South Pacific taro than the heavier clay loam soil of the Waipareira site.

Dry matter content of corms averaged 23% in cv. Niue, 21% in cv Ni Tonga and 20.0% in RR in the 1997-98 season Waipareira Trust trial. These percentages were not significantly different ($P < 0.05$). At UNITEC in the 1997-98 season dry matter content (Table 2) did not

Table 2. Dry matter content (%) of corms grown at UNITEC in 1997-98 season.

Harvest Date (HD)	Cultivar (C)	
	Ni Tonga	RR
16 July '98	18.7	17.6
18 August '98	18.2	17.8
29 September '98	15.2	14.6
23 October '98	16.1	16.3
$LSD_{(P<5\%)}$ (Ni Tonga values)	3.8	
$LSD_{(P<5\%)}$ (RR values)	3.3	
$LSD_{(P<5\%)}$ (HD x C)	4.5	

differ significantly ($P < 0.05$) either among cultivars or among harvest dates. The DM content of Niue corms harvested at UNITEC on 18 June 1999 was 19%. These dry matter contents are all much lower than the standard for markets in Samoa of 30% (Rogers *et al.*, 1992). We consider that the lower dry matter content of our New Zealand grown corms is the main explanation for Samoans and other Pacific islanders finding their texture to be too soft. We also consider that the mature appearance of our plants in winter is likely to be "premature" maturity caused by effects of low temperatures or short days rather than because the plants had fully matured and attained the desired dry matter content.

Our aim of producing large mature corms of South Pacific cultivars in a growing season in Auckland may, indeed, not be possible. The growing season is not long enough for plants grown from large planting material and irrigated well to mature. We have been informed (Kahoa Tauleva Trust, pers. comm., June 1999) that plants of cv. Ni Tonga grown from small (c. 25 mm diameter) suckers and with no irrigation reached maturity during the 1998-99 season. We found that the dry matter content of the small (400 g) corms from these plants was 31%. A comment from trust members was that their small mature corms were more preferable than our large immature corms. These anecdotal observations suggest that the production of South Pacific taro cultivars in New Zealand warrants further study.

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