

## THE PERFORMANCE OF GRANOLA POTATO AT FOUR SITES IN THE HIGHLANDS OF PNG

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### ABSTRACT

Cultivar trials were conducted during September to December 1998 to compare the yield of three varieties of potato; Granola (ware), Sequoia (ware) and Kennebec (processing). The trials were conducted at four sites in the Highlands over an altitude range of 1700 – 2500 m.a.s.l.

There was no G x E interaction for yield or any of the other parameters measured. There were significant ( $p<0.01$ ) yield differences between sites. The cooler sites of Kotuni (1800 m), Tambul (2300 m) and Ialibu (2500 m) yielded better, with the highest total yield (26.3 t/ha) obtained in Tambul and the lowest total yield (13.5 t/ha) from Keluwa (1700 m). Marketable yield was significantly ( $p<0.01$ ) higher in Kotuni (18.2 t/ha), followed by Ialibu (11.3 t/ha).

The total yield of Granola (21.0 t/ha) was as good as Sequoia (21.6 t/ha) and Kennebec (20.6 t/ha). The yield of Kennebec was higher than that reported earlier. It was noted that Kennebec produced bigger sized tubers, resulting in more marketable yield.

**Keywords:** Potato variety, Sequoia, Granola, Kennebec, performance, fertilizer

### INTRODUCTION

In PNG, potato has become a cash crop for farmers in high altitude areas. The annual demand is about 10,500 tonnes of which 85 % is for ware or cooking potato. On average there is an annual shipment of 1600 tonnes from the Highlands to Port Moresby (FPDC, 2000). The main areas of production are Tambul / Tomba (WHP), Sirunki (EP), Ialibu (SHP), Gembogl (SP) and Kotuni / Okapa (EHP).

The two recommended commercial potato varieties are Sequoia (ware or cooking) and Kennebec (processing) (Sawanga 1991). Following the 1997 drought, the variety Granola was introduced as a stopgap measure, since Sequoia seed was not available. Granola is a ware potato and was reported by highland farmers to have yielded well ('Fresh Produce News No.144', FPDC, 1999). It is a common variety in the highlands of the Philippines.

This multi-location trial was carried out to compare the yield of Granola with that of Sequoia and Kennebec. Past research had not found a variety superior in yield to Sequoia.

### MATERIALS AND METHODS

The trials were conducted at four Highlands sites, namely Tambul, Keluwa, Ialibu and Kotuni in (Table 1). Trial details are as follows.

A randomised complete block design with six replications was adopted at each trial site. Generation 5 seeds were used for all varieties. There were five rows in each plot with 12 seed tubers planted in each row. Tubers were planted 10 cm deep. The inter- and intra- row spacings were 80 cm and 40 cm respectively. The rate of fertiliser application was 1,200 kg NPK (10.25.12 + 2.5B<sub>2</sub>O<sub>5</sub>) per hectare (120 kg N, 131 kg P, 119 kg K and 9.3 kg B per hectare), applied before planting. Weekly sprays of mancozeb and orthene or karate were applied to control diseases and insect pests.

Data was collected from the middle three rows of each plot, and the outer two rows were treated as guard rows. The following parameters were recorded per plot: emergence, total tuber number and tuber weight at harvest; marketable tuber (> 60 g) number and weight; and number and weight of rotten tubers. Performance of each vari-

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**Table 1.** Site characteristics to Potato Trial

Site	Altitude (m)	Planting Date	Growing Periods (days)
Tambul, WHP	2,300	09/9/98	102
Keluwa, WHP	1,700	15/9/98	99
Ialibu, SHP	2,500	16/9/98	103
Kotuni, EHP	1,800	14/9/98	101

ety at each site was analysed and this data was also used to investigate G x E interactions.

## RESULTS

There was no variety or genotype by site (G x E) interaction for any parameter, so only main effects of site and variety are presented.

There were significant differences between sites in emergence and yield characters ( $p<0.01$ ) (Table 2). Total tuber yields were significantly higher at Tambul (26.3 t/ha), Kotuni (22.9 t/ha) and Ialibu (21.6 t/ha) than at Keluwa (13.5 t/ha). Mean tuber weight (hence marketable yield) was greater at Kotuni and Ialibu than at Keluwa and Tambul ( $p<0.01$ ).

There were significant differences between the varieties in total tuber number per plant, marketable tuber weight per plant and mean tuber size ( $p<0.01$ ). Emergence, total tuber weight per plant, marketable tuber number per plant and marketable and total tuber yield were not significantly different between varieties. Granola produced the most tubers per plant and Kennebec produced significantly bigger tubers ( $p<0.01$ ).

## DISCUSSIONS

The main objective of the trial was to evaluate the performance of Granola against Sequoia and Kennebec, the established ware and processing varieties respectively. Furthermore, it encompassed a multi-location comparison to determine whether Granola yield would differ from other varieties in different parts of the Highlands.

The analysis showed that there was no G x E interaction ( $p>0.05$ ). However, between the trial locations, there were significant differences in emergence and yield parameters ( $p<0.01$ ). Emergence was good in Keluwa but yield was

substantially lower than other sites due to infection by bacterial wilt and late blight. At Tambul, there were significantly more tubers produced but they were smaller in size ( $p<0.01$ ).

Total tuber number, tuber weight per plant and total yield were significantly ( $p<0.01$ ) greater in Tambul, but the tubers were small, probably because the trial had been infected with black scurf (*Rhizoctonia solani*). The site with the best performance overall was Kotuni, which produced significantly ( $p<0.01$ ) bigger tubers and greater marketable yield, followed by Ialibu. Generally, the higher and cooler sites of Tambul, Ialibu and Kotuni produced better yields. There was a lower incidence of bacterial wilt (*Ralstonia solanacearum*) and early blight (*Alternaria solani*) at Ialibu and Kotuni than the other two sites.

Granola produced significantly ( $p<0.01$ ) more tubers per plant than Kennebec but not significantly more than Sequoia. Granola tubers were smaller than Sequoia. Kennebec had fewer, but larger tubers than either Granola or Sequoia. However, the marketable and total yields obtained for Kennebec were not significantly different ( $p>0.05$ ) from the other varieties.

The results showed that the yield performance of Granola as a ware potato was as good as Sequoia and Kennebec at the four highland sites tested. The lack of a G x E interaction means that Granola yielded well at all the sites tested. In these trials the yield of Kennebec was similar to Sequoia.

However the potential for Granola to be accepted as an alternative ware potato is also influenced by tuber quality. Granola tubers were generally smaller than either Sequoia or Kennebec and their yellow flesh colour may be a disadvantage in some markets. Granola tubers are also roundish, unlike Sequoia which has flattened oval tubers. Farmers in the highlands of PNG tend to prefer flattened oval tubers that are white fleshed.

Table 2: The emergence and yield components obtained from each potato variety at the four highlands sites.

Treatment	Emergence (plants per plot)	Total tuber number per plant	Marketable tuber number per plant	Mean tuber weight (g/tuber)	Marketable yield (tonnes/ha)	Total yield (tonnes/ha)
<b>Site</b>						
Tambul	32.8	22.3	2.3	46.7	7.7	26.3
Keluwa	34.9	8.0	2.6	58.7	8.0	13.5
Ialibu	29.4	11.0	3.0	81.6	11.3	21.6
Kotuni	30.0	10.9	6.1	85.7	18.2	22.9
LSD (5%)	3.7	3.5	0.9	16.6	3.7	3.2
<b>Variety</b>						
Sequoia	32.2	13.3	3.3	66.3	11.0	21.6
Kennebec	30.5	11.1	3.3	84.7	12.4	20.6
Granola	32.7	14.8	3.9	53.6	10.5	21.0
LSD (5%)	NS	1.9	NS	9.2	NS	NS
CV (%)	10	24	35	23	39	18
Interactions (Site x Variety)	NS	NS	NS	NS	NS	NS

NS = Not significant ( $p>0.05$ )

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