

Traditional Japanese Vegetables: An Outline of Their Research and Development in New Zealand®

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INTRODUCTION

The 1996 census identified New Zealand as a country with a wide ethnic mix with peoples from Europe, the Pacific Islands, and Asia (Anon 2000). The Asian population, which is approximately 5% of New Zealand's total of just over 4 million, is giving the people as a whole an increasing awareness of Asian cuisine and Japanese food styles in particular. For example in Hamilton, New Zealand's largest inland city of 120,000 people, the number of Japanese restaurants has increased by 80% in the last 10 years. The increase in popularity of Japanese cuisine in New Zealand has resulted in a growing awareness and demand for the produce associated with that food style. At present many of the specialty food items such as wasabi and myoga ginger are imported as a processed product but as demand grows so too does the requirement for fresh rather than processed product.

This has tied in well with Crop & Food Research's new crops programme which has evaluated a range of specialist vegetables, well known in Japan as specialist vegetables and spices but relatively unknown in New Zealand, in a market-led approach to new crop research (Douglas, 1992a; Douglas, 1992b) with many of the crops evaluated being suited to production for supply to Japan during the Japanese off-season.

This paper outlines the research done by Crop & Food Research on some traditional Japanese crops being evaluated for possible future production in New Zealand.

TRADITIONAL JAPANESE CROPS RESEARCHED

Burdock. Burdock or gobo (*Arctium lappa*) is used as both a medicinal and vegetable. Until recently it was illegal to intensively grow this plant because the flower head burrs could become entangled in sheep's wool. Potential growers are still prohibited from importing seed. Preliminary trials initiated in 1991 throughout the country produced roots with a maximum length of 70 cm, maximum individual root weight of 400 g, and a yield ranging from 17 to 39 t·ha⁻¹ (Douglas et al., 1992; Burgmans, 1993). These trials concluded that spring-sown autumn-harvested burdock produced high yields and an acceptable product for the processing trade. Propagation in New Zealand is by seed.

Lotus Root. Lotus root or renkon (*Nelumbo nucifera*) is a true aquatic and is commonly grown in large ponds. Grown as a vegetable for the large swollen rhizomes it produces, lotus is also important as a medicinal and ornamental. The plants requirement for at least 6 months with temperatures greater than 15 °C will restrict it to northern parts of New Zealand (Follett et al., 2000). Research to date has concentrated on developing effective plant propagation technologies (Follett et al., 2003). Currently lotus root is propagated by seed.

Konjac. Konjac or konnyaku (*Amorphophallus konjac*) has traditionally been used for making noodles but is now almost exclusively grown for the carbohydrate glucomannan, which is used as a thickening and gelling agent. Research in New Zealand was initiated in 1994 using plant material imported from Gumma Prefecture. Initial results indicated that unlike Japan, konjac required shade for full production. Work in the Waikato has shown that konjac grows well under 50% shade in the free-draining pumice soils of the Central North Island. Currently there is no commercial production of konjac in New Zealand with current agronomic research designed to confirm that it can be grown profitably. Currently konjac is sold in New Zealand garden centres as an ornamental (Follett et al., 2002). Research has concentrated on agronomic management of the crop including weed control (James and Follett, 2000). Propagation in New Zealand is by offsets but can also be achieved using parent corms, seed, or tissue culture.

Myoga Ginger. Myoga ginger or mioga (*Zingiber mioga*) is grown for the subterranean flower buds it produces in summer-early autumn, which are eaten as a vegetable (Douglas, 1993). Although myoga will grow in full sun in Japan, New Zealand growers must provide approximately 50% shade or the crop will bleach with the leaves eventually turning white and dying. Research has shown that with shade this crop grows well on the free-draining soils in New Zealand's North Island where flower bud yields of 6.75–13.5 t·ha⁻¹ have been recorded. Initially some nonflowering clones were imported into New Zealand severely affecting commercial development. Early research has concentrated on improving crop management (Douglas and Follett, 1992a) including herbicide use (Follett et al., 1996). Propagation in New Zealand is by root division.

Perilla. Perilla or shiso (*Perilla frutescens*) is an annual herbaceous plant, which is used, extensively in Japanese cuisine. Red perilla is used as a dye for food colouring and as an ingredient in cake mixes and flavouring in beverages. Red perilla flower heads are used as a condiment while seedlings are used as a garnish. Green perilla is used as a vegetable with the leaves used as a wrapping for rice cake, in salads, and tempera. The seed can be used for oil production and as a flavouring in pickles.

Trials in the Hawkes Bay, Waikato, and South Auckland areas have demonstrated that perilla can grow well in New Zealand (Follett, 1995) provided the crop is not subjected to out-of-season frosts. Initial research in New Zealand concentrated on weed control in this crop (Hartley, 1996). The high perishability of fresh green perilla leaf will ensure that until there is a substantial local market in New Zealand the potential for commercial development is limited. Propagation is by seed.

Scallion. Scallion or rakkyo (*Allium chinense*) is a perennial onion grown for its underground bulbs, which resemble shallots. In addition to scallions appeal as a vegetable, research in China has also demonstrated anti-cancer properties (Scheffer and Douglas, 2004). Bulbs were imported into New Zealand in 1997. Using techniques similar to onion production yields at the Pukekohe Research Station south of Auckland of between 8 to 23 t·ha⁻¹ have been achieved, while planting at 33 plants/m² produced 39% more bulbs at harvest than at 27 plants/m² but reduced the mean size by 16%. Trials have demonstrated higher yields from early plantings (April or early autumn) while research on storage temperatures has shown minimum deterioration when stored at 5 °C (Scheffer and Douglas, 2002; Scheffer et al., 2003). Scallions are currently propagated using immature bulbs.

Japanese Taro. Japanese taro or satoimo (*Colocasia esculenta*) was introduced into New Zealand in 1992 for commercial evaluation. Field trials have indicated that the crop will grow well in areas of New Zealand, which have a frost-free period of more than 5 months. Research has shown that improved yields can be achieved by irrigating, using larger planting stock, and planting later in the season (Scheffer et al., 1999). This work also indicated that cormel sprouting and cracking could be major product quality issues. In New Zealand taro is propagated using cormels.

Wasabi. Wasabi (*Wasabia japonica*), a traditional Japanese condiment was introduced into New Zealand in 1982. Early research on production using the cultivar 'Midori' showed that the crop could be grown using a wide variety of production systems. This research evaluated wasabi production in concrete troughs using a similar bed construction to the wasabi tatami ishi stone mattress system used in Shizuoka Prefecture in Japan with marketable stems being produced in 18 months (Douglas and Follett, 1992b). Limited commercial production followed with using a wide variety of cultivars and production systems including various forms of modified streambed, hydroponics, and production in soil. Trials evaluating soil grown wasabi in Canterbury found that the crop grew well over two seasons and demonstrated that acceptable quality stems and high yields could be produced but there were high costs associated with hand weeding and pest and disease control. In these trials a total yield of c. 6 kg·m⁻² fresh material was obtained at the end of the second season (Martin and Deo, 2000). Subsequent work on this crop in New Zealand has concentrated on the effect of soil fertilisation on the flavour compounds of the rhizome particularly the allyl isothiocyanate (ITC) profile (Sultana et al. 2000). Research indicates that fertiliser type had little effect on yield but increasing the sulphur content of the fertiliser increased ITC content in petioles, stems, and roots (Martin et al., 2002). Nitrogen fertiliser alone reduced the ITC content. In these trials the total ITC content ranged from 1564 to 3366 mg·kg⁻¹ (fresh weight basis) (Sultana et al., 2002). Propagation in New Zealand is by seed, offshoot cuttings, or tissue culture

CONCLUSION

Japan's geographical similarity both as an island nation and similar latitudinal spread to New Zealand has ensured little difficulty in growing traditional Japanese vegetable crops in New Zealand. Unfortunately commercial development has been slow. The local New Zealand market is not large enough to support even small-scale production and export potential has often been thwarted by overseas tariff barriers both visible and invisible. Where a new crop product has been successfully, exported successes are usually short lived as overseas importers readily switch allegiances back to their own local suppliers once prices have been set.

Despite this, the popularity of Japanese cuisine is likely to increase world wide and with it the demand for quality fresh produce. New Zealand producers are likely to be in a unique position to supply this demand especially with quality out-of-season product.

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