CULTIVATING CHINESE WATERCHESTNUT WITHOUT SOIL (Project UCQ-8A)

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A new crop to Australia with current plantings of one to four hectares per year, commercial production of Chinese waterchestnut [*Eleocharis dulcis* (Burm. F.) Hensch] only dates back 12 to 13 years. In a previous article *(Access to Asian Foods, Issue 3, August 1998)* we addressed physiological issues suggesting that environmental factors (eg soil properties, photoperiod, temperature) and/or cultivation management (eg. nutrition, irrigation, harvest timing) primarily determine quality of fieldgrown waterchestnuts in Australia. Overseas information on cultural management of waterchestnut is limited and current and prospective producers seek guidelines. Some of the difficulties facing Australian producers are choice of growth media, plant nutrition and harvest procedures. Determining the optimal nutritional requirements of waterchestnuts was considered a priority issue for research (MIDMORE & CAHILL, 1998). Harvesting is still considered a major constraint to cultivation of waterchestnut in soil, particularly for `new' growers even though several functional mechanical devices are currently used in Australia.

In an effort to overcome these soil and management related obstacles to field cultivation, the Asian Vegetable Research Team at Central Queensland University studied the soilless culture of Chinese waterchestnut in a system which can easily be adopted.

Containers, growing medium and irrigation

For easy harvest of corms we used standard Australian polystyrene boxes used for packaging fruits, vegetables and seafood. To save on costs, second-hand boxes may be available through local foodstores. Polystyrene boxes are lightweight and provide some thermal insulation. Experience shows that these boxes are not perfectly waterproof and plant stolons can grow through the material so they need to be lined with plastic film. Since waterchestnut consistently produces new stems from mother corms and stolons, boxes cannot be enclosed from above as in other hydroponics systems (see for example MIDMORE & WU, 1999).

Many growth media are available for hydroponic production of vegetables. To protect the root system of waterchestnut in open boxes from light, a solid medium such as sand should be chosen. Open boxes cannot be kept clean of any organic contamination so used media should be discarded or sterilised before reuse.

Waterchestnut is an aquatic vegetable and the medium should be covered with water throughout the growth period. In addition to water loss through transpiration, water in open containers is also lost through evaporation which can be great during the summer season. Therefore, growth medium should not occupy more than two thirds the height of containers to leave space for sufficient water to reduce frequency of irrigation. Automatic irrigation has been successfully applied to this cultivation system and one grower is currently trialing oxygenation of irrigation water.

Boxes can be placed in protected areas such as green or polyhouse and also in the open. If placed outside, rainfall may supply a part of irrigation water but nutrient loss may occur when boxes run over during the course of heavy rainfall.

Nutrition

As there are few published recommendations for nutrition of Chinese waterchestnut (eg. ANONYMOUS, 1996 and HIBBERT & FINLEY, 1989). Fertiliser trials were conducted to establish optimal nutritional requirements. A practical fertilisation guideline is to apply a total of 20-30 g per m^2 each of N, P and K. Nitrogen should be applied in the form of ammonium (eg. Urea) rather than nitrate and potassium as muriate of potash (KCl) rather than sulfate of potash (K_2SO_4). KCl produced significantly higher total soluble solid contents than did K_2SO_4.

P and K can be applied entirely before planting. N should be split into two applications: 50 percent before (basal application) and 50 percent three months after (side dressing). If a greater percentage of N is applied before transplanting, the result is greater stem biomass at the expense of corms. However, if a greater part of N is applied as a side dressing, the result is a great number of corms of non-marketable size.

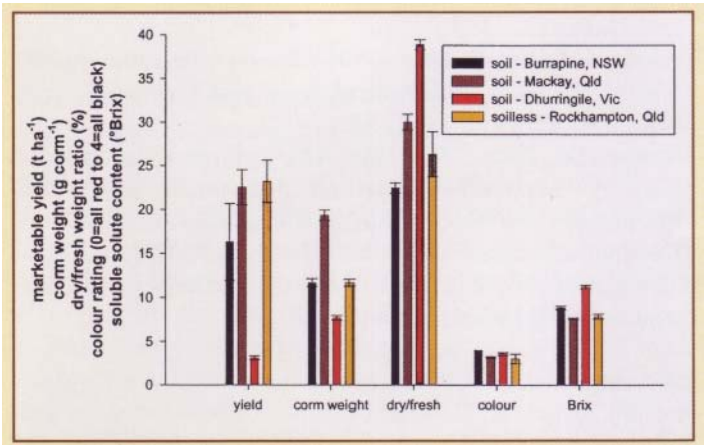
Although we have not researched effects of micronutrients on waterchestnut quality and yield, a volume of about 100-200 ml per m^2 per month of a standard micronutrient solution seems to be sufficient. Such solutions can be obtained from suppliers of hydroponics equipment around Australia.

Harvest, quality and yield

A great advantage of soilless cultivation of waterchestnuts in containers is the ease of harvest. When most stems have died off in autumn, irrigation should be discontinued and/or water drained off to facilitate easier handling of boxes. After washing off the growth medium, corms are easily separated manually or mechanically from roots and rhizomes with no further washing being required.

We tested waterchestnuts grown in soilless culture and found their quality and yield comparable with those cultivated in soil at various locations in Australia (Figure 1).

Figure 1. *Quality and yield of waterchestnuts cultivated with and without soil in Australia.*



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Scheduling

Scheduling of cultivation operations as described in Table 1 results from two years of experimentation in subtropical Rockhampton, Queensland and may vary according to climatic conditions at other locations. Since waterchestnuts do not tolerate temperatures below 0°C, the growing season in southern parts of Australia is much shorter than in the subtropical and tropical parts and corms should be planted in a protected environment and/or as soon as possible after the last frosts in spring.

Table 1. *Cultivation scheduling for soilless culture of Chinese waterchestnuts (Rockhampton, Queensland)*

Task	Date
Sowing corms in trays (`nursing')	Nov
Preparing boxes (eg lining with sand)	Nov
Fertiliser basal application (N, P, K)	Nov
Transplanting of most vigorous plants	Nov/Dec
Irrigation (weekly if by hand)	Nov/Dec – Jun/Jul
Micronutrient application (monthly)	Nov/Dec – Jun/Jul
Fertiliser side dressing (N)	Feb/Mar
Harvest	Jun/Jul

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EVALUATION AND DEVELOPMENT OF WASABI PRODUCTION FOR THE EAST ASIAN MARKET (Project DAT 34A)

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Wasabi *(Wasabia japonica) is* a brassica vegetable whose rhizomes are used as a hot-tasting condiment which resembles horseradish.

Reduction of area suitable for cultivation in Japan and the aging population of the traditional farmers have led to a decline in the availability of wasabi. The market however continues to expand as both Japanese and cross-cultural enthusiasts recognise the qualities of this product.

Tasmania has been identified as a state where cool climate vegetables thrive and can be available to Asian markets in the off season. For this reason wasabi has been trialed using the combined resources of RIRDC and the Department of Primary Industries, Water and Environment, in collaboration with local growers as a potential export crop.

Soil grown wasabi crops was established in shade houses at two sites in North Eastern Tasmania (each about 0.2 ha). These crops are now approaching their second year. Wasabi is sufficiently mature to harvest after two years with quality continuing to improve for a further two years.

Although wasabi is a semi-aquatic plant it requires good root aeration. Minor adjustments were made in the field to ensure optimum conditions of irrigation and drainage were provided. Environmental data is collected from one field site on a daily basis.

Wasabi.

A proposal made to the National Registration Authority for the classification of wasabi into a specific food group for the use of agricultural chemicals on organisms which may become potential problems was approved.

Trials conducted to determine optimum conditions for germination have given vital information regarding storage and handling of wasabi seed and seedlings. Continued interest from the private sector regarding the availability of both the marketable product and plant material for production purposes has led to the involvement of a Tasmanian tissue culture laboratory in the production process. Future investigations will assess the viability of tissue culture techniques as an option for propagating wasabi plantlets. Parent material will come from pilot plots of wasabi which are now almost three years old and from the current crops as they mature.

There has been continued liaison with the Murrindindi Shire Council in developing wasabi in Victoria. Both groups have sent representatives to production sites in the other state encouraging the exchange of information regarding cultural practices and potential Asian markets. Preliminary investigations into the market potential of wasabi has initiated great enthusiasm from prospective buyers. Present priority is given to ensure the continued supply to the market of a product of superior quality.

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