

HORTICULTURE

PROGRAM: Vegetable Industry

SUB-PROGRAM: Asian Vegetables

PROJECT: Bitter Melon Hybrid Yield Evaluation Trial

Project Officers: M. Traynor and M. Gosbee

Location: CPHRF

Objective:

- **To determine the yield potential of two selected hybrid bitter melon varieties and the local open pollinated line and to compare production peaks, fruit maturity indicators, fruit uniformity and general plant performance.**
- **To further assess grower and market acceptance of hybrid types.**

Background:

Bitter melon varietal research has been conducted by the Horticulture Division over the past two years and is funded under the national RIRDC project CQU-10a 'Consolidating the Asian Vegetable Industry'. Local bitter melon growers have been collecting their own seed from an open-pollinated line for many years and most select desirable fruits for this purpose. This practice has stabilised the local line to some degree but the problem of fruit variability remains a major concern to growers.

In an attempt to address this issue, a screening trial of 10 hybrids sourced from Australian and Asian seed companies was conducted in 1999. These were primarily evaluated for vigour, uniformity and desirable fruit characteristics (size, shape and colour).

Growers inspected the fruiting plants and along with researchers selected four hybrids as having some potential. Out of those, *Baizin* and *Moonlight* were selected for yield evaluation in 2000.

Unfortunately, *Baizin* seed was unavailable in Australia during the 2000 season so the very similar performing hybrid 'Known you green' was used.

Method:

The varieties used in the trial were 'Known you green' (hybrid), *Moonlight* (hybrid) and the local selection (open-pollinated), which was obtained from one of the local growers. Four replicate and randomised plots were planted of each variety. Four plants were in each plot, with 2 m between plants and 3 m between rows and 4 m between plots.

Plants were grown on vertical nylon netting trellis, pruned and trained as per local practice. Nutrients were provided through the irrigation system.

For early growth, 25N: 5P: 18K kg/ha/week was used.

After fruit set or about six weeks onwards, 12N: 5P: 18K: 5Ca kg/ha/week was used.

Lime and basal fertiliser were applied and the necessary trace elements were provided through irrigation water during early crop growth. The irrigation was carefully monitored with soil moisture tensiometers at depths of 20 and 40 cm. Harvest commenced at week eight and continued until week 17. Pests and diseases were controlled as required.

Results:

As the vines grew together on the trellis, results are not presented per plant but per plot of four plants.

Table 1. Yield parameters per plot (i.e. of four plants) of bitter melon varieties

Variety	Total fruit weight (kg)	Total fruit number	Average fruit weight (g)
Known you green	71.6 a	218.5 b	328 b
Moonlight	73.9 a	256.5 b	288 a
Local selection	66.7 a	177.5 a	376 c

Values are the average of four plots. Values followed by different letters within columns are significantly different (p<0.05)

Although the local selection produced fewer fruit, the total weight of fruit was not significantly different between the three varieties (Table 1). When average fruit weight is compared, both hybrids, especially Moonlight, produced significantly smaller but a greater number of fruit. The local selection produced significantly larger but significantly fewer fruit than either hybrid. While analysis shows that the hybrid fruit size was smaller, it was still within acceptable market range.

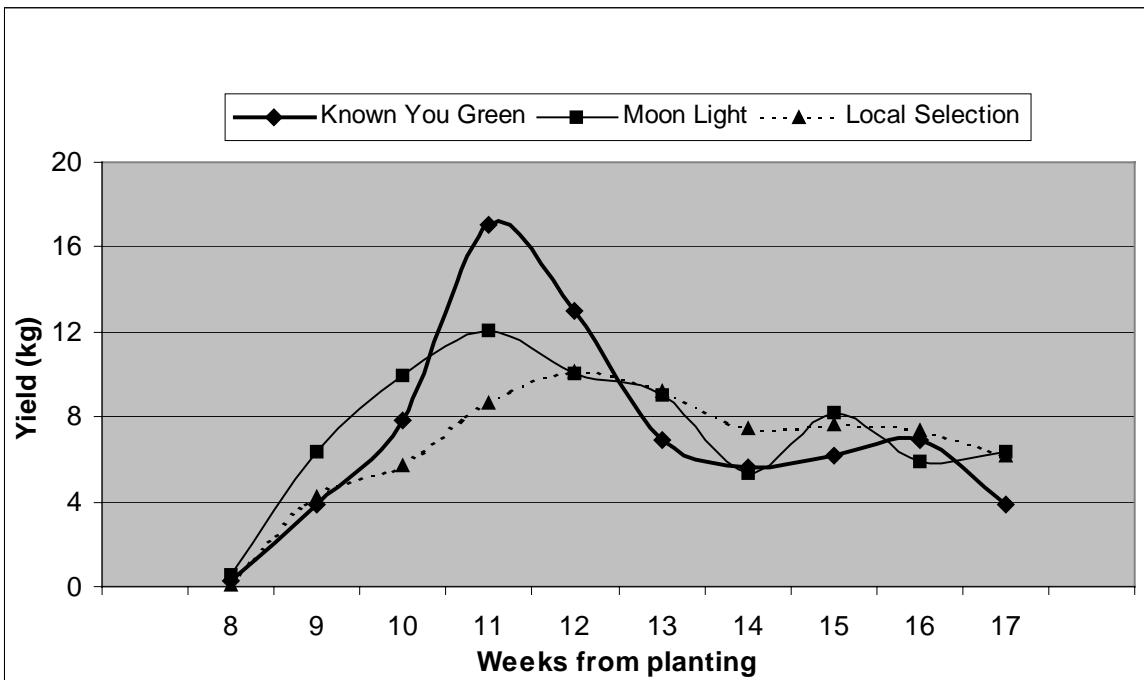


Figure 1. Weekly harvest totals per plot (4 plants per plot)

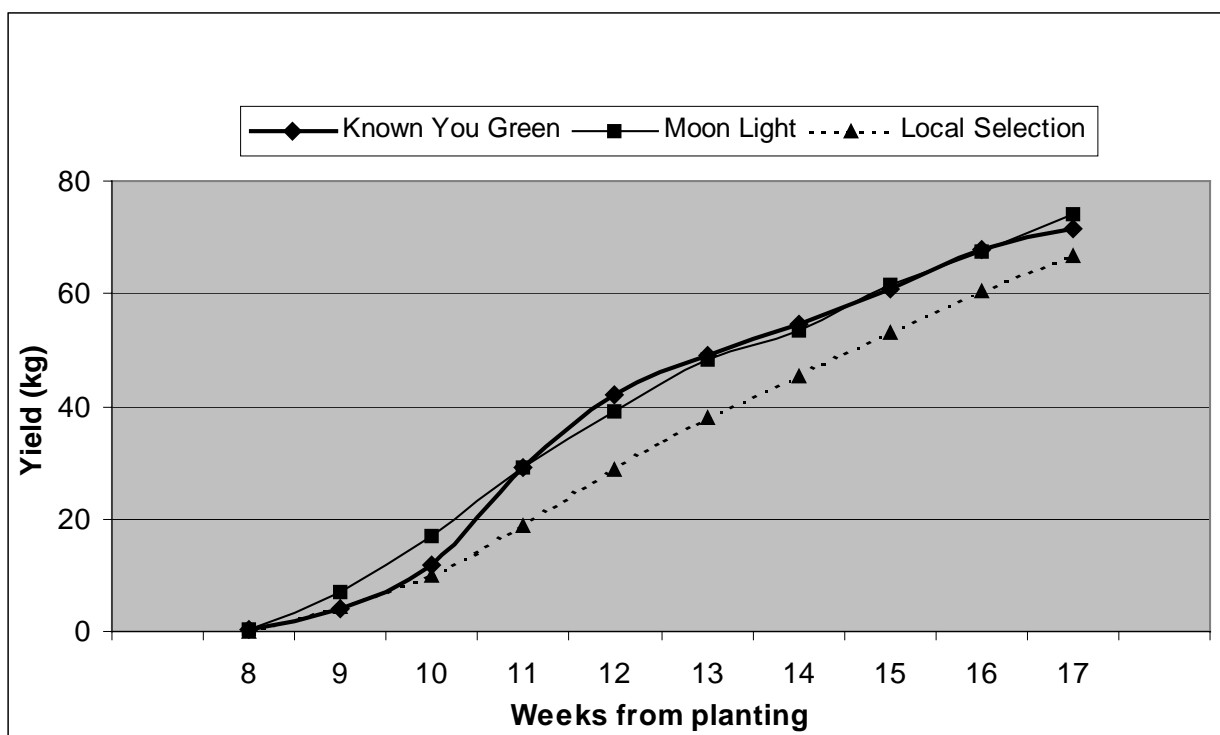


Figure 2. Cumulative harvest (four plants per replicate)

Harvest of all varieties commenced at eight weeks from planting and peaked at 11-12 weeks (Figure 1). This is more distinct with the hybrid lines and is most likely the initial fruit set on primary lateral branches. Further smaller peaks in the harvest would come from the flowering of secondary lateral branching. This trend in flowering and fruiting was also evident in yield figures from another trial promoting 'improved farming systems' on bitter melon and reported in this TAR.

Both hybrids had very similar cumulative yields throughout the trial (Figure 2). The local selection had lower yields early but by week 17, total cumulative yield was not significantly different from the hybrids.

Fruit that ripened on the plant before reaching a marketable size was not included in yield figures. Poor pollination or early injury to fruit can cause early ripening, but is also noted as a varietal characteristic. These fruit were recorded and the data presented as a percentage of total fruit harvested.

Known you green	12.1%
Moonlight	10.8%
Local selection	18.4%

Observations:

Bitter melons are harvested at the 'mature green' stage of development before the onset of ripening. This is an essential market requirement, but is difficult to determine at harvest. Even fruit showing no external colour change may have commenced ripening within the seed cavity. If packed, such fruit will continue to ripen in transit with the production of ethylene causing ripening of the whole box. Regular internal checks of harvested fruit showed that this problem was common in all varieties.

There were obvious differences in fruit uniformity between the hybrids and the open pollinated line. As expected, both hybrids produced very uniform fruit with size, shape and colour remaining constant over the harvest period. While fruit size (weight) of the local selection was fairly consistent, the shape and

colour of the fruit was quite variable. This is a common problem for growers. Because growers collect seed from their own crops, the quality of open pollinated fruit can vary between farms. Limited market studies show consumers prefer bitter melon that are 18-22 cm in length, 6-8 cm in diameter and with mid-green colour. Some growers reject up to 30% of their produce because it does not meet these requirements.

Field assessments of plant growth showed differences in vine vigour. While both hybrids produced adequate growth to support and protect the fruit, the local selection was more vigorous with many fruit totally hidden by vine growth. This may have caused the pale colour of some fruit. The local selection seemed well adapted to the local environment with fewer signs of leaf wilting during periods of heat stress.

Discussion:

After inspecting the trial, growers continued to show a definite preference for the open-pollinated type fruit with rough irregular bumps. It appears that the smooth-skinned hybrids have less market appeal and would require promotion to be accepted by consumers. Growers would like a uniform hybrid line with the rough appearance of the local selection. Unfortunately such a hybrid is not currently available.

Growers need to be more vigilant when selecting seed to minimise the variability in the local selection.

Harvesting fruit at the correct maturity remains a problem, especially for inexperienced growers. Maturity indicators at harvest can be very subtle and difficult to detect.

Further identification of production peaks would assist with planting schedules and completion time of harvest.

Detailed studies on manipulation of the male to female flower ratio (which can be as high as 50:1) could result in significant yield increases.

It is interesting to note that several growers purchased hybrid seed for planting in the 2001 season. This is a direct result of these research trials.

PROJECT: Snake Bean Fusarium Survey

Project Officers: M. Gosbee and K. Bui

Location: Darwin Region

Objective:

To determine the spread of Fusarium on snake beans in the Darwin region.

Fusarium oxysporum f.sp. *tracheiphilum* (Fot) causes 'early die' of snake bean crops when they begin fruiting. This disease was first noted in 1999 and since has spread rapidly amongst the Asian vegetable farms. The disease is spread through poor soil hygiene and also infected seed. As considerable departmental resources are invested in finding an alternative resistant line of snake beans, a survey was conducted to determine the actual spread of the disease. Snake bean production in 1999 was worth \$1.1 million.

Most Asian vegetable farms were visited and the disease was described. Samples were taken where possible and given to Plant Pathology for identification.