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## **ASPARAGUS PRODUCTION AND VARIETY YIELDS**

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### **SUMMARY**

Asparagus (*Asparagus officinalis* L.) was grown for a three-year period in a project funded by the USDA Sustainable Agriculture Research and Education program. The purpose was to demonstrate agricultural production methods and to educate Hawaiian farmers about the crop as well as to assist in developing a local asparagus industry. Since beginning the one-half acre project, asparagus production in Hawaii has grown and a market for fresh locally-produced asparagus is becoming established.

This report covers data obtained since the previous Vegetable Report 1. The yield data for the eight varieties tested are presented for each of the four harvests that took place during the project. During three years, the asparagus production from the test plots continued to increase and biennial harvesting is expected to continue without replanting for another 10 to 15 years. Production costs are expected to remain low enough for the crop to be profitable. Asparagus requires little maintenance and has few disease or pest problems. It needs only irrigation and fertilization which may be applied through drip tubing. The California varieties out yielded New Jersey varieties in Hawaii in terms of total weight of spears harvested, but one of the New Jersey varieties, Jersey Giant, consistently produced the largest number of small size spears. Small spears are preferred by some restaurants and bring a higher price. The winter harvest was smaller than summer harvests but, since prices are higher in winter, this may help to offset the lower yields.

### **INTRODUCTION**

In recent years, Hawaii's agricultural products have become increasingly diversified. While sugarcane and pineapple continue to be the largest crops, their acreage is smaller than in the past and many other crops are being developed

for local consumption, export niche markets and non-food uses. Asparagus is one of the most promising new crops in Hawaii. It has many advantages for the local grower in that it requires little maintenance and, once established, does not need replanting for 10 to 15 years. It has few pest or disease problems in

Hawaii and requires only irrigation in dry areas and fertilization. Asparagus is tolerant to brackish water.

Asparagus is usually started by seeding trays and transplanting to the field; however, it is possible also to seed the field directly. After transplanting, the ferns are allowed to grow for about one year. Spear production for harvest begins by stopping the irrigation water for one month and drying down the ferns. The dead stalks are cut and removed from the field. When irrigation and fertilization are resumed, new spear production begins almost immediately and harvesting can begin. After the initial harvest, the ferns are allowed to grow again for another six months. During the life of the field, harvesting may take place as often as every six months. In Hawaii, asparagus harvesting may be scheduled at any time of year and, on larger farms, field increments may be staggered so that harvesting can continue all the time.

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## MATERIALS AND METHODS

Eight different asparagus varieties were included in the trial: three New Jersey varieties, Jersey Gem, Jersey General and Jersey Giant; and five California varieties, Atlas, Apollo, Purple Passion, Grande, and UC 157. Details of the planting, maintenance, and harvesting of the crop may be found in HARC Vegetable Report 1. During the first year, the asparagus planting plot layout was established and plants were started and transplanted to the field. Crop maintenance procedures were followed and the crop growth and health were observed and reported. The plot layout was a randomized complete block

with 12 replicate plots per variety. Each replicate plot had four lines 10 feet in length, but only the second line was harvested for data records, while the rest of the lines were harvested by the farmer for sale. Plant to plant spacing was 12 inches and the lines were four feet apart. The harvest data were recorded as number and total weight of spears in each of three size categories per harvest date. Small size included spears with a diameter at the base of 1/4 to 3/8 in. Spears smaller than 1/4 in were discarded. Size medium spears were 3/8 to 5/8 in and jumbo were over 5/8 in. Harvests lasted from the time the first spears appeared until they became too small and spindly for commercial sale. The first harvest lasted one week and harvests increased in length until the fourth which lasted three weeks. The total yields also increased accordingly.

The irrigation schedule for the project was dictated by the availability of water. The project area was irrigated for two to three hours every other day. This proved to be quite sufficient in this location. During the first year of the project, two different fertilizer rates were tested. The results showed that there was no difference in yield between the two, so consequently, after the first harvest the entire project area continued to receive the lower rate. Fertilizer applied was 11-37-0 and urea for a total per crop of 81 lb/acre phosphorus and 80 lb/acre nitrogen.

Instead of a cold period as in temperate regions, the irrigation was stopped for one month allowing the ferns to die back and rest. Upon renewing the irrigation and fertilization, spears again sprouted and were harvested. At the end of 1997, the first harvest took place and the results were made available to farmers. Following the first harvest, the asparagus field was again allowed to grow to ferns and was watered and fertilized as before. The second harvest took place in August

1998, the third harvest in January 1999, and the fourth harvest in August - September, 1999. The planting will continue to be maintained by the cooperating farmer and is expected to continue yielding a marketable crop every six months for the next 10 to 15 years.

## RESULTS

The asparagus seedlings were planted at a density of one plant per foot in lines four feet apart. This proved to be suitable spacing and as the ferns grew, the canopy closed in sufficiently to shade out weeds. Asparagus produces an extensive root mass that continues to spread and remains productive for years. Asparagus is a very low maintenance crop with few nematode, insect or disease problems in Hawaii. During the first year of growth there was one *Cercospora* fungus blight outbreak requiring fungicide treatment, but no problems were encountered during the rest of the project.

The irrigation and fertilization practices followed in the trial proved to be suitable for asparagus production in Hawaii's subtropical environment. In temperate regions, asparagus ferns die back each winter and the regrowth in the spring is the single harvest for the year. It is now evident that with sufficient irrigation and fertilization, two harvests per year are sustainable in Hawaii and these can be scheduled as desired to take advantage of market prices. By drying out different sections of a farm at successive intervals, continual production can be maintained.

The planting density in our trial gave good yields; however, it is probable that a number of different planting densities would yield well because over time, the asparagus roots form a spreading mass that covers a larger area than the original planting. There were virtually no insect or disease problems in our test plots,

although a number of diseases of asparagus occur in Hawaii. It is likely that these diseases would be more prevalent in more humid, higher rainfall areas of the state. Nonetheless, they will be controllable with currently registered fungicides. Weeds must be controlled during the period between transplanting and closing over of the ferns, but after that there is little weed pressure for the life of the field.

The yields in each size category were summarized for each variety and each harvest and are shown here in Tables 1 through 5. The California varieties Atlas and Apollo gave the greatest overall yields in this project. It is likely that varieties bred in California are better suited to the warm Hawaii climate than are the New Jersey varieties. The yields as presented in the attached tables show clearly that Atlas and Apollo out yielded the other varieties in almost every case in the medium and jumbo size categories and in total weight of spears. Jersey Giant consistently produced the greatest weight of small size spears. The small spears are preferred by many hotel and restaurant chefs who are willing to pay a higher price for them. Purple Passion asparagus produced purple color spears that were different and attractive. This variety produced a large number of jumbo size spears, but spears were often deformed. Although this variety might be enjoyable for a home gardener, it is not recommended for commercial producers. By mounding soil over the rows or by covering the rows with a black polyethylene mulch "tunnel" white asparagus spears are produced. These are sold for a higher price, but it is not known at this time whether the higher price would offset the extra work involved.

## DISCUSSION

The acreage planted with asparagus in Hawaii has increased over the duration of this project. The local markets for fresh Hawaii asparagus are only just beginning to develop. Hotel and restaurant chefs have expressed approval for the fresh asparagus as compared with asparagus imported from the mainland or Mexico. Small fresh produce outlets as well as large supermarkets also expressed an interest. So far, asparagus producers are unable to supply all of the potential local markets on a continual basis, but it seems apparent that a much larger local market can be developed than currently exists. Eventually, Hawaii asparagus could become an export crop, possibly to Japan. Hawaii could supply asparagus to the export market at seasons of the year when it is not available from any other

countries. In addition, asparagus would be a good crop for organic farming in that it requires little or no pest or disease control and fertilizer can be provided as organic manure.

Many agricultural workers in Hawaii that were previously employed by the sugarcane and pineapple industries are no longer with them since these large plantations have significantly reduced their acreage. Some of these farmers have started small farming operations of their own and are thus in need of information and assistance in developing new crops and markets for their produce. This project was undertaken to educate and inform Hawaiian farmers about asparagus which has apparent potential as an alternative crop for diversified agriculture in Hawaii.

**Table 1.** Yield of SARE asparagus project first harvest December 15 - 22, 1997. Results shown as average weight of spears in lb/A in three size categories.

| <u>cultivar</u> | <u>small</u> <sup>1</sup> | <u>cultivar</u> | <u>medium</u>           |
|-----------------|---------------------------|-----------------|-------------------------|
| Purple Passion  | 110 a                     | Jersey Gem      | 105 a                   |
| Jersey General  | 180 b                     | Jersey General  | 120 a                   |
| Grande          | 250 cd                    | Purple Passion  | 120 a                   |
| Apollo          | 265 cd                    | Grande          | 160 a                   |
| Jersey Gem      | 265 cd                    | Jersey Giant    | 165 a                   |
| Atlas           | 275 cd                    | UC 157          | 240 b                   |
| UC 157          | 300 cd                    | Atlas           | 245 b                   |
| Jersey Giant    | 330 d                     | Apollo          | 260 b                   |
| <u>cultivar</u> | <u>jumbo</u>              | <u>cultivar</u> | <u>total, all sizes</u> |
| Jersey Gem      | 15 a                      | Jersey General  | 315 a                   |
| Jersey General  | 20 a                      | Purple Passion  | 315 a                   |
| Jersey Giant    | 25 a                      | Jersey Gem      | 385 ab                  |
| Purple Passion  | 90 ab                     | Grande          | 505 abc                 |
| Grande          | 100 ab                    | Jersey Giant    | 525 bc                  |
| UC 157          | 125 ab                    | UC 157          | 665 cd                  |
| Atlas           | 190 b                     | Atlas           | 715 d                   |
| Apollo          | 225 b                     | Apollo          | 750 d                   |

<sup>1</sup> Means in the same column followed by the same letter are not significantly different by Duncan's Multiple Range test, P = 0.05.

**Table 2.** SARE asparagus project second harvest August 11-28, 1998. Results shown as average weight of spears in lb/A in three size categories.

| <u>cultivar</u> | <u>small</u> <sup>1</sup> | <u>cultivar</u> | <u>medium</u>           |
|-----------------|---------------------------|-----------------|-------------------------|
| Purple Passion  | 215a                      | Purple Passion  | 730 a                   |
| Jersey General  | 450 b                     | Jersey General  | 835 ab                  |
| Grande          | 450 b                     | Jersey Gem      | 1015 bc                 |
| Atlas           | 460 bc                    | Grande          | 1075 bcd                |
| Apollo          | 540 bcd                   | UC 157          | 1210 cd                 |
| UC 157          | 595 cd                    | Jersey Giant    | 1220 cd                 |
| Jersey Gem      | 600 cd                    | Atlas           | 1280 d                  |
| Jersey Giant    | 650 d                     | Apollo          | 1320 d                  |
| <u>cultivar</u> | <u>jumbo</u>              | <u>cultivar</u> | <u>total, all sizes</u> |
| Jersey Gem      | 200 a                     | Jersey General  | 1575 a                  |
| Jersey Giant    | 210 ab                    | Purple Passion  | 1675 ab                 |
| Jersey General  | 280 ab                    | Jersey Gem      | 1800 abc                |
| UC 157          | 415 abc                   | Grande          | 1975 abcd               |
| Grande          | 450 bc                    | Jersey Giant    | 2080 bcd                |
| Atlas           | 600 cd                    | UC 157          | 2225 cd                 |
| Purple Passion  | 725 de                    | Atlas           | 2340 de                 |
| Apollo          | 865 e                     | Apollo          | 2725 e                  |

<sup>1</sup> Means in the same column followed by the same letter are not significantly different by the Least Significant Difference (LSD) test, P = 0.05.

**Table 3.** SARE asparagus project third harvest January 20 - February 5, 1999. Results shown as average weight of spears in lb/A in three size categories.

| <u>cultivar</u> | <u>small</u> <sup>1</sup> | <u>cultivar</u> | <u>medium</u>           |
|-----------------|---------------------------|-----------------|-------------------------|
| Purple Passion  | 130a                      | Purple Passion  | 230a                    |
| Jersey General  | 340 b                     | Jersey General  | 425 b                   |
| Atlas           | 405 bc                    | Grande          | 505 b                   |
| Grande          | 445 bcd                   | Jersey Gem      | 545 bc                  |
| Jersey Gem      | 460 cd                    | Jersey Giant    | 595 bc                  |
| Apollo          | 475 cd                    | UC 157          | 605 bc                  |
| UC 157          | 545 d                     | Atlas           | 720 cd                  |
| Jersey Giant    | 555 d                     | Apollo          | 815 cd                  |
| <u>cultivar</u> | <u>jumbo</u>              | <u>cultivar</u> | <u>total, all sizes</u> |
| UC 157          | 85 a                      | Purple Passion  | 570 a                   |
| Jersey Giant    | 95 ab                     | Jersey General  | 890 b                   |
| Jersey Gem      | 100 ab                    | Grande          | 1055 bc                 |
| Grande          | 150 abc                   | Jersey Gem      | 1065 bc                 |
| Jersey General  | 185 abc                   | UC 157          | 1080 bc                 |
| Purple Passion  | 220 abc                   | Jersey Giant    | 1210 bc                 |
| Atlas           | 255 bc                    | Atlas           | 1340 cd                 |
| Apollo          | 270 c                     | Apollo          | 1540 d                  |

<sup>1</sup> Means in the same column followed by the same letter are not significantly different by the Least Significant Difference (LSD) test, P = 0.05.

**Table 4.** SARE asparagus project fourth harvest August 23 - September 15, 1999. Results shown as average weight of spears in lb/A in three size categories.

| <u>cultivar</u> | <u>small</u> <sup>1</sup> | <u>cultivar</u> | <u>medium</u>           |
|-----------------|---------------------------|-----------------|-------------------------|
| Purple Passion  | 160 a                     | Purple Passion  | 1108 a                  |
| Atlas           | 361 b                     | Jersey General  | 1653 b                  |
| Jersey General  | 361 b                     | Jersey Giant    | 1894 b                  |
| Grande          | 421 bc                    | Jersey Gem      | 1898 b                  |
| Jersey Gem      | 477 bc                    | UC 157          | 1953 b                  |
| UC 157          | 492 c                     | Grande          | 2009 b                  |
| Apollo          | 503 c                     | Atlas           | 2114 bc                 |
| Jersey Giant    | 531 c                     | Apollo          | 2556 c                  |
| <u>cultivar</u> | <u>jumbo</u>              | <u>cultivar</u> | <u>total, all sizes</u> |
| Jersey Giant    | 28 a                      | Purple Passion  | 1988 a                  |
| Jersey Gem      | 29 a                      | Jersey General  | 2115 a                  |
| UC 157          | 85 a                      | Jersey Gem      | 2398 ab                 |
| Jersey General  | 100 a                     | Jersey Giant    | 2453 ab                 |
| Grande          | 185 ab                    | UC 157          | 2511 ab                 |
| Atlas           | 470 bc                    | Grande          | 2620 ab                 |
| Apollo          | 471 bc                    | Atlas           | 3001 bc                 |
| Purple Passion  | 714 c                     | Apollo          | 3514 c                  |

<sup>1</sup> Means in the same column followed by the same letter are not significantly different by the Least Significant Difference (LSD) test, P = 0.05.

**Table 5.** SARE project summary of total yields for four harvests over a two-year period. Results shown as average weight of spears in lb/A.

| <u>Variety</u> | <u>Dec. 1997</u> | <u>Aug. 1998</u> | <u>Jan. 1999</u> | <u>Sep. 1999</u> | <u>Total</u> |
|----------------|------------------|------------------|------------------|------------------|--------------|
| Jersey General | 315              | 1575             | 890              | 2115             | 4895         |
| Purple Passion | 315              | 1675             | 570              | 1988             | 4548         |
| Jersey Gem     | 385              | 1800             | 1065             | 2398             | 5648         |
| Grande         | 505              | 1975             | 1055             | 2620             | 6155         |
| Jersey Giant   | 525              | 2080             | 1210             | 2453             | 6268         |
| UC 157         | 665              | 2225             | 1080             | 2511             | 6481         |
| Atlas          | 715              | 2340             | 1340             | 3001             | 7396         |
| Apollo         | 750              | 2725             | 1540             | 3514             | 8529         |