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Luffa Sponge Gourd Production Practices for Temperate Climates

By Jeanine M. Davis

Luffa sponge gourds are tropical and subtropical members of the *Cucurbitaceae* and have been cultivated for centuries in the Middle East and India, China, Japan, and Malaysia. The plant is an annual vine with tendrils and large, cylindrical pepo (berry) fruit that are edible when young. The mature, dry fruit consists of a hard shell surrounding a stiff, dense network of cellulose fibers (sponge), adapted for support and dispersal of hundreds of flat, smooth, black seeds.

Using luffa sponges for personal hygiene and household cleaning is common in many countries. In the United States, the demand for luffa sponge products for skin care is increasing. Currently, most luffa sponge gourds are produced in tropical or semitropical environments such as Taiwan, Korea, El Salvador, Guatemala, and Colombia. Wholesale prices of $0.40 to $0.50 per sponge, coupled with the rising demand for luffa products and a desire for new, high-value crops, have stimulated interest among some North American growers.

It has been suggested that the natural absence of luffa outside tropical and subtropical regions was due, in part, to poor germination at low temperatures and a need for high light-intensity and temperature for optimum plant growth. Therefore, the use of transplants may be needed to obtain desired stands for profitable production. Soaking seed in water for 24 hours prior to planting is recommended to aid germination.

Luffa sponge gourd plants are similar in growth habit to cucumbers (*Cucumis sativus* L.). Substantial yield increases can be obtained by training cucumbers to a vertical trellis rather than growing them on the ground. If luffa gourds contact the ground, fruit rot, discolored sponges, and misshaped gourds may result; thus, luffa plants also benefit from being trained to trellises. The benefits of using black polyethylene mulch and drip irrigation for luffa gourd production have also been demonstrated.

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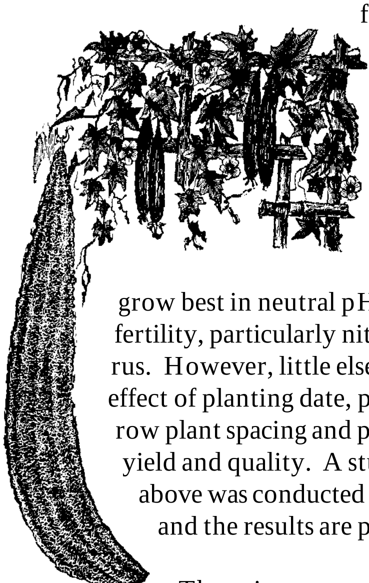
Appearing Within . . .

Most luffa cultigens are monoecious. Staminate flowers develop in an inflorescence, whereas pistillate flowers develop singly or in association with a staminate inflorescence. As with most monoecious cucurbits, the lower nodes of luffa usually bear only staminate inflorescences, followed by nodes having both female inflorescences and male flowers, which are followed by solitary male flowers at the uppermost nodes. Increasing the number of male flowers would increase yield potential and hasten maturity -- important factors for a tropical plant grown in a temperate climate. Removing the first 4 to 6 lateral shoots would hasten male flower development. However, preliminary research in Missouri indicated that most fruit is set on lateral and sub-lateral shoots and that pinching out the main stem encouraged early fruit set.



Luffa gourds have been reported to grow best in neutral pH soil with high fertility, particularly nitrogen and phosphorus. However, little else is known about the effect of planting date, planting method, in-row plant spacing and pruning influence on yield and quality. A study to determine the above was conducted in North Carolina and the results are presented within.

Three in-row spacings, (12, 24, and 6 inches) and 3 pruning treatments (no pruning, removing the first 4 lateral shoots, and topping the main stem at node 6) were examined under transplant and direct-seeded conditions.

Seeds from high-quality luffa sponges were obtained from China through J.A. Ayers (Earth Products, Lapeer, Mich.). Transplants were produced in the greenhouse in plastic flats with 2 X 2 inch cells. Seeds were soaked in water for 24 hours and sown, 2 seeds per cell, in a soilless peat-bark mix.

Seeds (that had been soaked in water for 24 hours) were sown 2 per hole (1 inch deep) or 4-week-old transplants were set out. A 5-foot-tall vertical trellis system was constructed of 4 X 4 inch wood posts with a 1-inch-diameter steel pipe as the horizontal top wire. Individual strings were suspended over each plant to help train plants to the top of the trellis. Direct-seeded plants were thinned to 1 plant per hole 3 weeks after planting. The first 4 lateral shoots were pruned from all plants, and plants were trained to the strings as needed. A hive of honey bees was positioned near the field at first bloom.

All dried gourds were harvested. Dried gourds were soaked for 5 to 10 minutes until the fibrous interior (sponge) separated easily from the hardened skins. Sponges were air-dried and seeds were removed by shaking. A subjective evaluation system was used to compare sponges for overall fiber density, fiber strength, and visual appeal.

Transplants resulted in a better plant stand than did direct-seeded plants. Regardless of planting date, 99 to 100 percent of the transplants survived. In contrast, direct-seeding ranged from 63 to 74 percent stand survival.

Dried gourds harvested immediately after the first killing frost were the highest quality because they were mature before they started to dry. For the first harvest, transplants produced 2.8 times more gourds than direct-seeded plants. Delayed planting resulted in low first-harvest yields. For the total harvest (first and second harvests), yields from transplants were 1.2 times higher than those from direct-seeded plants. Plants set on the first planting date provided higher total yields than those set on the last date. Thus, a growing season of 188 days is too short to produce luffa from seed. To produce high yields of mature gourds in a short growing season, transplants must be set in the field as soon as all danger of frost is past. The closest in-row spacing (12 inches) resulted in the highest yields for two of the three harvests and the total season harvest. For luffa, neither pruning lateral shoots nor topping the main stem had any significant effect on yields on any of the three harvest dates. For the total season, however, no pruning produced more gourds than topping at node 6.

Sponge size is important to luffa product manufacturers and determines what products can be made from a particular sponge. Neither planting date nor planting method had any effect on average sponge length. Sixty-two percent (62%) of sponges were 12 to 18 inches long, and < 5% were 6 inches long. Average sponge diameter, however, was greater for sponges from transplants than direct-seeded plants and from the earliest planting date. Large-diameter sponges can be

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split open longitudinally and flattened into sheets for manufacturing mitts, pads, and washcloths. Sponge quality was evaluated using characteristics important to buyers. The importance of a characteristic depends on the final use of the sponge. For example, a very dense network of fibers is needed for bath sponges, whereas a less-dense network of fibers is needed for pot scrubbers. Overall fiber-density and visual-appeal ratings were highest with sponges from plants spaced 12 inches apart, and visual-appeal ratings were lowest for sponges from plants spaced 24 inches apart. Topping the main stem produced sponges with the best fiber-density, strength, and visual-appeal ratings. In contrast, not pruning resulted in sponges with the lowest ratings for all three characteristics.

Results from this study indicate that high yields of quality luffa sponges can be produced in a cool, temperate climate if transplants are field-set immediately after the danger of frost has passed. High total yields were obtained by using a close in-row spacing (12 inches) and by either not pruning plants or just removing the first 4 lateral shoots. Plants spaced 12 inches apart in the row with the first 4 lateral shoots removed produced the highest marketable yields. Plants spaced 36 inches apart in the row produced the largest diameter gourds, whereas plants with the highest yields of bath-sponge diameter gourds (2 to 3 inches) were spaced 12 inches apart in the row. By planting at the widest spacing and topping the main stem, plants obtained high fiber-density, strong fibers, and excellent visual appeal. Those treatments, however, also resulted in the lowest yields. Spacing plants 12 inches apart and removing the first 4 lateral shoots produced sponges with a medium fiber-density and good visual appeal -- probably suitable for bath sponges. Further studies on sponge quality, grading standards, and market needs are required.

The question remains whether luffa sponge gourds produced in North America can be competitive with the Asian and South American imports. Economics of production are not yet known and labor costs may be high, but yields appear to be favorable; the highest total yield obtained in this study was approximately 31,174 gourds/acre.

From an article appearing in HortScience 29(4):263-266. 1994.

SIGNIFICANT WATER LOSSES OCCUR FROM USE OF OPEN, UNLINED DITCHES

This article appeared in ***The Cross Section****, published by High Plains Underground Water Conservation District No.1, Vol. 42-No. 5. May 1995.*

At one time or another, we've all squirted water on a concrete surface and watched it instantly evaporate during hot, windy summer days. The same principle is not nearly as amusing when agricultural producers pump groundwater into open, unlined ditches and expose it to sunlight and wind.

Evaporation of water from the surface of a filled irrigation ditch is the second major type of agricultural water loss on the Texas High Plains. The volume of water lost from irrigation ditches due to evaporation depends mainly on temperature and humidity. Evaporation rates are relatively high in the region because of the area's semiarid climate.

Research conducted by the High Plains Water District indicates that 73.73 gallons of water are lost to evaporation per foot of irrigation ditch during a 2,000-hour irrigation season (April, May, June, and July). While evaporation losses do not vary with soil type, it is known that different soils are more prone to seepage losses.

For example, if a producer was irrigating from a quarter-mile-long open, unlined ditch in Amarillo Fine Sandy-Loam soil, the total water loss during a 2,000-hour irrigation season would be 7,091,040 gallons [5,372 x 1,320 feet]. This would equal 21.7 acre-feet of water, which is enough to supply a 4-inch application of water over 65 acres.

Producers can combat these water losses either by installing an underground pipeline or by using aluminum or plastic (PVC) pipe or polypipe to convey water from the well to the field.

DROUGHT STRATEGIES:

Coping with Declining Groundwater Levels

Soil and Water, Cooperative Extension, University of California, Fall 1991, No. 82
Original article by Blain Hanson

Drought conditions greatly reduce groundwater recharge, eventually causing groundwater levels to decline. This, in turn, causes changes in pump performance, making longer irrigation times necessary to prevent deficit irrigation. Declining groundwater levels also reduce the pressure in pressurized irrigation systems. Following are measures growers can take to cope with declining groundwater levels:

1. Install a booster pump to increase the discharge pressure of the pumping plant. The pressure provided by the booster pump should equal the difference between the existing pressure and the normal operating pressure. A booster pump can also provide some suction lift in addition to the discharge pressure, which will increase the capacity of the pumping plant. The suction lift imposed on the booster pump should not exceed 20 to 25 feet.

2. If pumping levels decline to such an extent that suction no longer occurs in the intake pipe of the deep-well turbine, air will enter the pump and the capacity will decrease, which will in turn cause the water level in the well to rise. When the water level in the well rises, water will again be pumped until the level is lowered and air enters the intake. This may cause surging, which can be corrected either by (a) lowering the pump or (b) reducing the drawdown in the well (the difference between static water level and pumping water level) by decreasing the pump discharge. One of the following three options can be used to reduce the drawdown:

a. Install a throttle valve (butterfly or gate valve) in the pump discharge, or reduce the number of laterals operating per set in a sprinkler or drip system;
b. Raise the impeller (for semi-open impellers only);
c. Decrease the engine rpm (for an engine-driven pump).

3. Install a new pump capable of providing the desired discharge pressure and capacity at greater pumping lifts. This will increase horsepower demand and require a large electric motor or engine.

4. Add an additional stage to the existing pumping plant. This will require a larger motor or engine.

Note: If surging in the well does not occur, lowering the pump will not increase the pump discharge. The pump discharge depends on the elevation difference between the discharge pipe and the pumping water level, not on the depth of the pump. Lowering the pump under these conditions may slightly increase the discharge because of increased friction losses in the column pipe.

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