Bitter gourd
(*Momordica charantia*)

Family – Cucurbitaceae

**Introduction**

Bitter gourd is one of the most popular vegetables in Southeast Asia. It is a member of the cucurbit family along with cucumber, squash, watermelon and muskmelon. Native to China or India, the fast growing vine is grown throughout Asia and is becoming popular worldwide. Depending on location, bitter gourd is also known as bitter melon or balsam pear. The immature fruits and tender vine tips are used in a variety of culinary preparations. The fruits and shoots are soaked in salt water to remove some of their bitterness and then boiled, fried or pickled. The fruit of bitter gourd fruit is similar in nutritional value compared to other cucurbits with the notable exceptions that it is much higher in folate and vitamin C. The vine tips are an excellent source of vitamin A. The medicinal value of the gourd in the treatment of infectious diseases and diabetes is attracting of scientists worldwide.

**ACTION**

- Bitter Melon helps achieve positive sugar regulating effect by suppressing the neural response to sweet taste stimuli.
- Bitter Melon is useful in treating Diabetes.
- Bitter Melon has shown significant antilipolytic and lipogenic activity.
- Bitter Melon is useful as an emetic, purgative, as an anthelmintic, in piles, and jaundice

**Climate and soil requirements**

Bitter gourd grows well under the same conditions preferred by other cucurbits. It is normally grown as an annual crop, but can perform as a perennial in areas with mild, frost-free winters. The plants thrive in the tropics from lowland areas to altitudes of up to 1,000 m. Bitter gourd requires a minimum temperature of 18oC during early growth, but optimal temperatures are in the range of 24-27oC. It is more tolerant to low temperatures compared to other gourds, but cool temperatures will retard growth and frost will kill the plant. The plant is adapted to a wide variety of rainfall conditions, but regular irrigation is needed to ensure high yield.
Bitter gourd tolerates a wide range of soils but prefers a well-drained sandy loam soil that is rich in organic matter. The optimum soil pH is 6.0-6.7, but plants tolerate alkaline soils up to pH 8.0.

Choosing a variety

Numerous hybrid and open-pollinated varieties are available. Hybrid usually produce higher yields but their seeds are relatively expensive and must be purchased for every planting. Open-pollinated varieties have the advantage that their seeds may be saved and used for future plantings.

The choice of variety depends on market preference in a certain region, and is based on fruit shape and color. Generally, there are three types; 1) small, 10-20 cm long, 100-300 g, usually dark green, very bitter 2) long, 30-60 cm long, 200-600 g, light green in color with medium size protuberances, and only slightly bitter and 3) triangular fruit type, cone-shaped, 9-12 cm long, 300-600 g, light to dark green with prominent tubercles, moderately to strongly bitter. Select a variety that is well adapted to your growing conditions preferred by consumers. Growers are encouraged to compare the performances of different varieties during different seasons to identify superior types.

Fig. 2. Varieties of bitter gourd differ in fruit size, color, ridging, and degree of bitterness

Variety uses in Bhutan is local. Source is unknown.
Preparing the field

Thorough land preparation and a well-prepared bed is required. Prepare a finely pulverized nursery bed of 1 m wide, 15-20 cm high and convenient length. Form 20 cm high beds during the dry season and 30 cm or higher during the wet season.

Planting

Direct seeding is the most common method of planting. In cooler climates, it may be necessary to start the seedlings in a greenhouse to ensure good germination.

Direct seedling

Optimum plant density differs with variety and usually ranges from 6500 to 11,000 plants per ha. In some intensively managed plantings, a closer spacing of 50 X 50 cm is used resulting in 40,000 plants per ha. On raised beds, sow two or three seeds per hole at a depth of 2 cm. Space holes 40-60 cm apart in rows spaced 1.2-1.5 m apart. Plants density using this spacing will range from 13,600 to 17,300 plants per hectare. When planted in warm soil, seedlings will emerge in a week or less. Thin to one seedling when they have four true leaves.

Transplanting

Sow seeds in small plastic pots or containers using a potting mix that has good water holding capacity and good drainage such as peat moss, commercial potting soil, or a potting mix prepared from soil, compost, rice hull and vermiculite or sand. Plant two or threes seeds per container and thin to a single seedling when they have four to six true leaves. Water the seedlings thoroughly every morning to maintain a moist but not wet soil.

Seedlings are ready for transplanting 15-20 days after sowing or when they are 10-15 cm tall. Bare-root plants will not survive so pull seedlings with their root balls intact before transplanting. Transplant seedlings into the field at spacing similar to those used for the direct seeding method.
Staking and trellising

Bitter gourd grows very fast and vines elongate rapidly within two weeks after planting. Thereafter, the plant sends out lateral stems. Staking and trellising will increase fruit yield and size, reduce fruit rot and make spraying and harvesting easier.

There are several methods of trellising bitter gourd, bamboo poles, wood stakes, PVC pipes or other sturdy materials are used to provide support and keep the fruit and foliage off the ground. The trellis is arranged either in a lean to or tunnel structure. The trellis should be 1.8-2.0 m high, constructed from stakes 1.2-1.8 m apart which is almost similar to the plant row spacing.

For the lean to type, the stakes are joined between two adjoining beds forming an A-shape structure. Horizontal stakes are installed at the top joining all other beds. The stakes support the climbing vines and lateral stems. Strings are used to secure adjoining stakes. Plantings are easier to manage and more productive when 2 m high rather than 1 m high string trellises are used.

For the tunnel type, plants are grown inside an arch-shape structure made of either PVC or galvanized iron pipe. Plants are supported by bamboo stakes where vines freely climb and reach the top. The vines and lateral stems will then grow along the structure.

Another type of trellising consists of a system of vertical strings running between top and bottom of horizontal wires or horizontal wires running across all directions on top.

Pruning

Bitter gourd develops many side branches that are not productive. To improve yield, remove lateral branches until the runner reaches the top of the trellis. Leave 4-6 laterals and cut the top of the main runner to induce early cropping. Removal of lateral branches in the first 10 nodes has a positive effect on total yield. Without pruning, most of the female flowers occur between the 10th and 40th nodes or at a height of 0.5-2.0 m.
Fertilizing

Bitter gourd requires a balance of nutrients from organic and chemical fertilizers. Fertilizer application rates depend on soil type, fertility level and soil organic matter. In sandy soils, fertilizer application consists of a basal application followed by four side dressings, providing a total of 184 kg N, 112 kg P2O5 and 124 kg K2O per ha. In clay or heavy texture soils, the entire amount of P and one third of N and K is applied before planting wither by broadcasting and tilling or by banding a few cm deep and to the side of the plant row in the bed. The balance of N and K is applied in two or more side dressings. No matter the soil type, the first side dressing is applied when plants have four to six true leaves. Subsequent side dressings are applied at two week intervals. Compost or manure can be used to satisfy the basal application of organic fertilizer.

Irrigation

Bitter gourd will not tolerate drought. Maintain good soil moisture in the upper 50 cm of soil where the majority of roots are located. Fields are furrow-irrigated every 10 days during the cool dry season and weekly during the hot dry season. During the rainy season, drainage is essential for plant survival and growth. In water limited environment, tickle or drop irrigation is an efficient method of supplying water and nutrients to bitter gourd plantings.

Controlling weeds

Mulching is commonly used for bitter gourd crops grown on raised beds. Use organic or plastic mulch depending on availability. Organic mulch such as dry rice straw or grass is usually available and cheaper than plastic mulch. If you use organic mulch, be sure that it is free or weed seeds. Mulch can be laid down before or after transplanting and after sowing. Several herbicides are available, but make sure that you select herbicide recommended for bitter gourd. Hand or hoe weeding can be performed as needed.

Controlling diseases and pests

Bitter gourd is susceptible to many of the same diseases that affect other cucurbits. It is a host of water melon mosaic potyvirus and is infected by downy mildew. Cercospora leaf spot, bacterial wilt, fusarium wilt and root knot nematode. Fungal infections often occur during prolonged wet periods, Fungicide sprays may be used under such conditions to prevent infection. The use of resistant varieties is the best defense for most of these diseases.

Fruit fly is the most destructive insect pest of bitter gourd. This fly is difficult to control because its maggots feed inside the fruits, protected from direct contact with insecticides. Bury any infested fruits to prevent the build up of fruit fly populations. To prevent flies from laying eggs inside the fruits, enclose the gourd in paper while it
is on the vine. A cylinder of paper, longer than the fruit is tied with string around the stalk. Where consumers want their bitter gourd straight rather than curved, tie a pebble at the end of a long piece of string to the flower end to weigh down the fruit and keep it from curling. Double layer paper bags may be used against fruit fly and are applied when gourds measure 2-3 cm in length.

Beetles, thrips, cutworms, bollworm, aphids and mites are other common pests of bitter gourd.

Chemical control of insect pests should be done only when significant damage occurs. Avoid pesticides that kill or inhibit the development of beneficial organisms especially the pollinators. Choose pesticides that last only a few days. Wear protective clothing and follow all instructions carefully on the label when applying pesticides.

Harvesting and Handling

Bitter gourd requires close attention at harvest time. The fruits develop rapidly and must be harvested frequently to keep them from becoming too large or too bitter. Normally it takes 15-20 days after fruit set or 90 days from planting for fruit to reach marketable age, however, bitter gourd can be harvested at earlier stages depending on the purpose for which it will be used. Fruit should be light green, thick and juicy and the seeds should be soft and white. Harvest every 2-3 days using a pair of scissors or a sharp knife to cut the fruit stalk. If a fruit remains too long on the vine, it will turn spongy, sour yellow or orange and split open.

Bitter gourd yield can vary depending on variety and crop management. Average marketable yields are 8-10 t/ha.

Fruits of bitter gourd do not keep long and should be sold in the market immediate. Remove damaged and deformed fruits. Carefully arrange fruits in bamboo baskets or boxes and store in a cool place at 12-13oC with 85-90% relative humidity. Under this condition, fruit storage life can be extended 2-3 weeks. Bitter gourd is chilling sensitive and damage may occur if kept below 10oC. Do not store fruits at temperatures above 13oC, as this will result in fruits turning yellow and splitting open. Keep harvested fruits away from other fruits (such as banana, pineapple and apple) that release large amounts of ethylene, a ripening hormone.