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How to Grow Mulberry Bushes with Bio-Plant and Pro-Plant **(Mulberry Leaves for Silkworm Rearing and Sericin Production)**

Introduction

- Unlike citrus, mulberry (*Morus* spp.) is grown here as a leaf crop, not for its fruit. The leaves are harvested repeatedly to feed silkworms (*Bombyx mori*) as part of sericulture / moriculture. Commonly used leaf-production varieties include *Morus alba*, *Morus indica*, and hybrids such as Kanva-2 and S-36; the project should confirm which variety suits Kilifi's soil and climate best.
- Because the leaves are eaten directly by silkworms, leaf quality is everything: nitrogen, protein, and moisture-rich leaves grown in fertile, chemical-free soil give the healthiest silkworms and the best sericin yield. This is exactly where Bio-Plant (soil) and Pro-Plant (foliar) make the biggest difference.
- Because mulberry is repeatedly pruned and re-harvested rather than left to fruit once, the growth cycle described below is organised around the **pruning and harvest cycle** instead of a flowering/fruiting stage.

1. Compost and Soil Preparation

- See the file *How to Make Compost with Bio-Plant* for how to make rich compost with Bio-Plant. Soil preparation with plenty of Bio-Plant compost will make a big difference to leaf growth. Add compost to the planting holes and spread it generously around each bush after planting. Add more compost around each bush monthly.
- If you do not make compost, refer to: *How to Prepare the Soil With and Without Compost*.

1.1 Preparing and Planting Cuttings in the Nursery

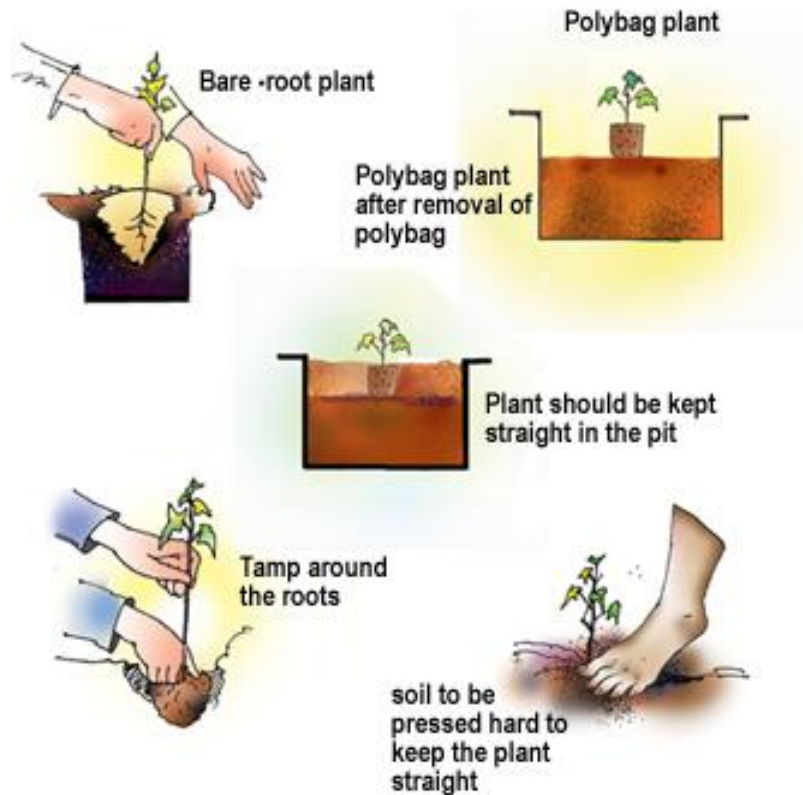
- Mulberry for leaf production is normally propagated from stem cuttings rather than seed, as cuttings root quickly and grow true to the mother bush. Take cuttings 15-20 cm long with 3-4 active buds from healthy, high-yielding mother bushes, using a sharp, clean 45° slanting cut at the base so the bark does not split.
- Prepare a nursery bed of fertile, well-drained soil mixed with Bio-Plant compost. Plant the cuttings at a 45° angle at about 15 cm x 7 cm spacing, leaving one active bud exposed above the soil.
- Water the nursery bed every 2-3 days. In a well-managed nursery, cuttings typically root and put out new leaves within about 4-6 weeks. See section 4 below for soaking the cuttings in Bio-Plant before planting.

1.2 Transplanting Rooted Cuttings to the Field

- Once a cutting has rooted well and is producing new shoots, transplant it into a prepared hole about 45-60 cms. x 45-60 cms. x 45-60 cms., using a 1:1 mixture of bio-compost and soil, the

same way as described for citrus saplings. Keep the plant upright and press the soil firmly around the roots (see diagram below).

- Recommended spacing for leaf production is closer than for a fruit tree, commonly around 90 cm x 90 cm, or up to 3 m x 3 m in wider hedge-row systems — closer spacing gives more leaf per hectare but needs more frequent pruning. Confirm the final spacing with an agronomist for the variety and soil used at Kilifi, and consider a legume intercrop in the first year for extra nitrogen and income while the bushes establish.



1.3 Applying Bio-Plant During Establishment and Regrowth

- Once a month, place 5-10 kgs. of bio-compost around each young bush — a minimum of 5 kgs. if the bush is under 1 metre high, and about 10 kgs. once it is taller. Use 15 kgs. if the soil is very poor or there is a disease problem. Keep the compost away from direct contact with the stem.
- If you do not have bio-compost, pile fallen leaves and prunings around the base and spray the soil once a month with a mixture of 100 cc of Bio-Plant in 100 litres of water, pouring about 2 litres at the base of each bush where the roots are. This restores the soil micro-organisms, which is especially important on land where chemical fertilizers have been used before.
- Continue this monthly soil application right through the bush's life, including through every pruning and harvest cycle described below — it is what rebuilds the leaf mass after each harvest.

2. Establishing the Harvesting Table and the Pruning Cycle

- Mulberry grown for leaf production is deliberately kept low and bushy rather than allowed to grow into a tall tree, so that the leaves stay within easy reach for repeated hand-harvesting.

2.1 First Pruning After Transplanting

- A few days after transplanting, cut the young plant back to about 10 cm above ground level using a clean secateur. This looks drastic, but it forces the plant to send up several new shoots from the base instead of one tall stem.

2.2 Building the Permanent "Harvesting Table"

- After about 6 months, when the new shoots have grown to roughly 1 metre, select the 3-4 strongest shoots and prune them back to about 20-25 cm above the ground. This fixed stump height becomes the bush's permanent "harvesting table," which is maintained at this same height at every future pruning.

2.3 The Ongoing Prune-and-Harvest Cycle

- The first leaf harvest is normally ready about 8-9 months after transplanting.
- After each harvest, prune the bush back down to the harvesting-table height to trigger a fresh flush of tender new shoots and leaves — this is the mulberry equivalent of the citrus flowering/fruiting stage, and it repeats for the life of the plantation.
- In warm, well-irrigated conditions, a new harvest is typically ready every 6-8 weeks (roughly 40-55 days), giving perhaps 5-8 cycles a year. Treat this as a starting estimate to be confirmed by trial at Kilifi, since it depends heavily on rainfall, irrigation, and variety.
- Leaves can be picked individually by hand (usual for young silkworms), or whole shoots/branches can be cut and stripped (usual for older silkworms). Whichever method is used, plan the Pro-Plant spray schedule below around the harvest date so the leaves are clean by the time they are fed to the silkworms.

3. Applying Pro-Plant to the Leaves

3.1 General Guidelines Tied to the Pruning Cycle

- Spray 20 cc of Pro-Plant in 20 litres of water. For a hectare, mix 500 cc of Pro-Plant with 500 litres of water.
- Begin spraying about 2-3 weeks after each pruning, once the new shoots have leafed out, then repeat every 10-14 days to build up healthy leaf mass ahead of the next harvest.
- Stop spraying at least 7 days before the leaves are due to be picked and fed to the silkworms.
- **Important: because these leaves are eaten directly by silkworms rather than sold as produce, and silkworms are unusually sensitive to anything on the leaf surface, we recommend a small-scale feeding trial first — feed a limited batch of silkworms leaves from Pro-Plant-treated bushes and compare their health against leaves from untreated bushes — and that Gary check this with a sericulture specialist before spraying at full scale.**
- Spray the leaves before 9 a.m. when the pores are open most. Use equipment that gives a fine, misty spray, directed diagonally upwards so it reaches the underside of the leaves as well as the top. Be generous, but you do not need to hit every leaf.
- If pesticides are used at all, spray them at least 3 days before or after spraying either bio-fertilizer — though we encourage avoiding chemical sprays altogether, both because they kill the beneficial micro-organisms and because of the risk to the silkworms.

3.2 For Young or Newly-Established Bushes

- While a bush is young and has not yet been through its first full pruning cycle, spray the leaves monthly with 20-30 cc of Pro-Plant per 20 litres of water to help it build a strong root and shoot system before the first harvest.
- For a hectare of young bushes, mix 500 cc of Pro-Plant with 500 litres of water. Once the bush is in its regular prune-and-harvest cycle, follow the schedule in 3.1 above instead.

3.3 Applying Bio-Plant as a Fungicide

- Replace any chemical fungicide with Bio-Plant mixed with water.
- a. **For Prevention:** Dosage: 5-10 cc/20 litres of water. Spray on the bush, avoiding the leaves as much as possible. Only apply this if you think there might be a fungus problem — regular compost and Pro-Plant applications should already give good protection.
- b. **A Little Fungus:** 10-20 cc/20 litres of water. Spray on the bush if some fungus is already present, avoiding the leaves as much as possible.
- c. **The Whole Bush Has Fungus:**
 1. Spray 50 cc/20 litres of water only on the branches. Or:
 2. Scrub or brush 50 cc/20 litres of water onto the branches. Avoid the leaves. Repeat every 7-10 days if the fungus persists.
- If pesticides must be used, spray them at least 3 days apart from either bio-fertilizer, since the chemicals kill the micro-organisms that are multiplying in the soil and on the leaves.

4. Preparing Mulberry Cuttings for Propagation

- Select cuttings only from healthy, vigorous, high-leaf-yielding mother bushes.
- Cut lengths of 15-20 cm with 3-4 active buds, using a sharp, clean 45° slanting cut at the base — avoid splitting the bark.
- Soak the cuttings in water containing 20 cc of Bio-Plant per 20 litres for 24 hours before planting (10 cc of each bio-fertilizer per 10 litres of water if using both together). If the number of cuttings is small, reduce the water to just a few litres.
- Plant the cuttings promptly after soaking, following the nursery method in section 1.1 above.

5. Mulching

- It is important to mulch the soil between the bushes, or to grow a legume crop there, to suppress weeds.

5.1 What is Mulching?

- Mulching is one of the most important ways to maintain healthy bushes. A mulch is any material applied to the soil surface for protection or improvement of the area covered — it is really Nature's own idea, since fallen leaves, twigs, bark, and other organic material do this naturally.

5.2 Benefits of Mulching

- When applied correctly, mulching has the following beneficial effects on plants and soil:
 - Mulches prevent loss of water from the soil by evaporation.

- Mulches reduce the growth of weeds, when the mulch material itself is weed-free and applied deeply enough.
- Mulches keep the soil cooler in summer and warmer in winter, maintaining a more even soil temperature.
- Mulches prevent soil splashing, which stops erosion and keeps soil-borne diseases from splashing onto the leaves.
- Organic mulches improve soil structure as they decay, adding nutrients to the soil.
- Mulches prevent crusting of the soil surface, improving water absorption.
- Mulches help prevent soil compaction and encourage extra root growth in the mulched area.

5.3 How to Apply Mulch

- Before applying mulch, weed the area first. Spread a generous layer of mulching material around the bushes, keeping it 2-3 inches away from the stems to prevent stem rot from wet mulch.
- Newly planted bushes need a mulch circle 3-4 feet in diameter, maintained for at least the first three years. Do not pile mulch against the stem.
- For established bushes, mulch from close to the stem out to at least 6-12 inches beyond the outer spread of the branches, since the root system can extend well beyond the canopy.

5.4 How Deep to Mulch

- Fine-textured mulches (such as wood or bark) should not be more than 2-3 inches deep, or they can suffocate roots and cause yellowing leaves and poor growth.
- Coarse-textured mulches (such as straw) allow good air movement and can be up to 4 inches deep — a 4-inch depth will also stop most weeds growing.
- Mulches of shredded leaves should never be deeper than 2 inches, as they tend to mat together when wet and restrict water and air to the roots.

