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How to Grow Sorghum with Bio-Plant and Pro-Plant

Note: It's tempting to rush ahead, plough the soil, and plant a monoculture of sorghum. But the interests of the farmers are not served in this way. The guidelines below will help the farmers to regenerate their soil while producing more nutritious sorghum with a higher yield and without disease.

1. Soil Preparation

1.1 Plant a Cover Crop

- The best way to prepare the soil is to plant a multi-species (5+ species) cover crop that includes legumes and grasses, such as carrots, peas, sorghum, millet, turnips, Sudan grass, cereal rye, annual ryegrass, clovers, buckwheat, oilseed radish, sunflower, sun hemp, and hairy vetch. Consult with your local agronomy department about which cover crops to plant because the choice depends on the climate, the state of the soil, and your goals. Grow diverse microbial life before you plant the sorghum.
- **Mow (Flatten) the Cover Crop:** Mow the cover crop down (don't plough it) just before it produces seeds and plant through the bio-mass after having left it for 2 weeks on the soil to decay.
- If you prefer you could let your livestock graze on the cover crop and flatten it while they add urine and manure. Don't let them eat all of it because you want the soil to be covered.
- **Don't Till (Plough) the Soil:** Don't till the soil or plough in the bio-mass because then you will kill the fungi networks in the soil that feed the plants, destroy the soil structure, compact the soil, and loose the soil cover, among other harmful effects, such as the oxidization of organic matter, soil erosion, hot soil temperature, etc.
- Plant the sorghum plants in the rows and leave the bio-mass on the soil. It will keep the soil covered and prevent weeds while providing food for the soil bacteria and fungi that will provide nutrients to the roots.

Planting into a terminated cover crop.

- Spray Bio-Plant on the planting rows (only) as you plant through the bio-mass. Mix 1 litre with 1,000 litres of water per hectare. 500 litres in 500 litres per acre. It is very beneficial to add the microbial life in Bio-Plant to the planting rows.

1.2 Compost and Soil Preparation

- If you prefer you could make a lot of compost mixed with Bio-Plant and spread it over the planting rows. You will need about 2 months to make the compost and a minimum of 5 MT per hectare (2.5 MT per acre).
- **How to Make Compost:** See the file at ***Section 3.2*** called ***How to Make Rich Compost with Bio-Plant – Handouts***. Click here for how to make rich compost with Bio-Plant. Scroll down to ***Section 3.2.*** Soil preparation with a lot of compost made with Bio-Plant will be invaluable in increasing growth. Add compost to the planting rows and spread it generously. Add more compost monthly on Day 30 and Day 60. The minimum amount of compost per acre should be 2.5 MT.
- If you only intend to apply manure, then spray Bio-Plant onto the manure at the rate of 1 litre per 1,000 litres of water. Per acre this would be about 500 cc in 500 litres.

1.3 Plant a Companion Crop (Intercrop)

- If you don't want to plant a cover crop in spite of the many benefits of doing so, intercrop the rows of sorghum with a companion plant. You must have diversity of microbial life in the soil.
- Here is a list of crops that make good companions for sorghum. Click here.

2. Seed Preparation

- You might like to refer to the file ***How to Prepare Seeds with Bio-Plant***. Click here. The following section comes from there and describes an effective way to soak seeds with Bio-Plant. Don't use GMO seeds. Why? Because you won't get a high enough Brix level in the plants and this means that insect pests will see the plants as food.

2.1 The Common Approach to Soaking Vegetable Seeds

- If you are soaking a lot of seeds, put the seeds in a container with water. Soak them for up to 24 hours in warm water mixed with Bio-Plant. For small seeds, such as flower seeds, 12 hours or overnight is enough. The container of water only needs to cover the seeds by 2 inches. Place a cloth over the top to increase the warmth during the soaking. Keep the seeds in a warm place out of direct sunlight. Soaking them will speed up germination in the soil.
- Soak the seeds in water that contains 20 cc of Bio-Plant per 20 litres. (The ratio is 10 cc per 10 litres of water.) If the amount of seeds is small, reduce the water to just a few litres. It does not have to be exactly 20 cc of Bio-Plant and more than this is fine, so do not worry.

Seed Planting Tray with Sections.

- After soaking, plant the seeds as soon as possible in a seed potting soil tray where there is potting soil in each small section of the tray. Usually, you would place one seed per small hole or two seeds if the hole is large, but you can easily space 20 seeds in the same 1.5 to 2-inch hole. Cover them over with more soil and water them.
- If you do not have a tray with holes for the individual seeds, place them in a flat tray. Put some newspaper on the bottom and cover the newspaper with potting soil. Use a stick and create a small ditch about 0.5 cms. deep from one side of the tray to the other. Place the seeds in the ditch and then cover them over with a little soil.

Flat Tray with Ditches

- It is beneficial to spray the potting soil before use with water mixed with Bio-Plant (at a ratio of 20 cc of Bio-Plant in 20 litres of water).
- Cover the soil with wet paper or a wet cloth. Leave them for about 5 days until the seedling has penetrated the surface, grown 2-3 inches, and formed some good roots, and will soon be too large for its growing space. Then plant each sprouted seedling in an individual pot or black plastic planting bag.
- Once your seedlings have several leaves you will need to move them to a larger pot to give them more room to grow, especially if you placed many in the same potting hole section. Let the plant grow and become sturdy and leafy before transplanting it into composted furrows in a field.

Seeds, which have germinated.

3. Spraying the Plants with Pro-Plant

- ***Shake the bottle vigorously before opening it.*** Pour it into a suitably-sized container and mix it with water according to the amounts below. Turn on the water tap so that the water pours into the container very rapidly.
- Spray the plants with water that contains a ratio of 20 cc of Pro-Plant per 20 litres.
- For a hectare, mix 500 cc of Pro-Plant with 500 litres of water. For an acre, mix 250 cc of Pro-Plant with 250 litres of water. For half an acre, mix 125 cc of Pro-Plant with 125 litres of water. For 200 sq.m mix 40 cc with 40 litres of water. For an area of 10 metres x 10 metres (100 sq.m) mix 20 cc in 20 litres of water.
- Spray on the leaves before 9 AM when the pores are open most. Direct the spray diagonally upwards so that the spray hits the underside of the leaves as well because this is where the pores (stomata) are. Make sure that the spray is a very fine, misty, foggy kind of spray. Be thorough and generous when you spray.
- 5 cc = one full tea spoon.
- Sorghum (90-120 days): Spray on Days 10, 20, 30, 40, 50, 60, 70, 80 until 10 days before you harvest. Alternatively spray every 10 to 15 days, but spray every 7-10 days once the flowers appear.
- The farmer does not need to spray much of the mixture when the plants are very small.
- Choose the frequency of spraying that suits you best. Spraying every 7 days will give a higher yield than every 10 days. If the farmer chooses to spray every 10 days, then when the flowers appear, change to spraying every 7 days and continue spraying every 7 days.

Spray just enough of a misty spray to soak the leaves of seedlings.

4. For Extra Yield - Applying Additional Bio-Plant

- Because sorghum grows for up to about 3 months, additional micro-organisms should be added to the soil around the plants, ideally once a month (every 30 days) on Day 30 and Day 60. Compost made with Bio-Plant would be very effective way to do this. Provide several kgs. per plant.
- If the farmer does not have any compost, he could apply Bio-Plant by spraying it mixed with water at the base of the plants. Do not spray Bio-Plant on the leaves as this will cause them to turn yellow.
  - Hectare: Spray 500 cc of Bio-Plant mixed with 500 litres of water, or better 1 litre of Bio-Plant mixed with 500-1,000 litres of water.
  - Acre: Spray 250 cc of Bio-Plant mixed with 250 litres of water. You could spray 500 cc in 500 litres of water in order to provide more micro-organisms.

5. Spraying Pesticides

- When you spray Pro-Plant the leaves get coated with micro-organisms that protect the leaves from disease. The Bio-Plant strengthens the immune system so that the plants are less susceptible to disease.
- If disease is a problem in the area, add Bio-Plant (5 cc) to the Pro-Plant (20 cc) in 20 litres of water and spray this over the sorghum.
- In 100% organic farming chemical sprays should not be used. But if you wish to spray chemical pesticides, please spray them at least 3 days apart from when you apply the bio-fertilizers as the chemicals kill the micro-organisms that are now multiplying in the soil and being sprayed onto the leaves.

6. Mulching

- It is important to mulch the soil around the plants or to grow a legume crop there so as to suppress the growth of weeds.

6.1 What is Mulching?

- Mulching is one of the most important ways to maintain healthy landscape plants and trees. A mulch is any material applied to the soil surface for protection or improvement of the area covered. Mulching is really Nature's idea. Nature produces large quantities of mulch all the time with fallen leaves, needles, twigs, pieces of bark, spent flower blossoms, fallen fruit and other organic material.

6.2 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 to prevent weed germination or to smother existing weeds.
  - Mulches keep the soil cooler in the summer and warmer in the winter, thus maintaining a more even soil temperature.
  - Mulches prevent soil splashing, which not only stops erosion but keeps soil-borne diseases from splashing up onto the plants.
  - Organic mulches can improve the soil structure. As the mulch decays, the material becomes topsoil. Decaying mulch also adds nutrients to the soil.
  - Mulches prevent crusting of the soil surface, thus improving the absorption and movement of water into the soil.
  - Mulches help prevent soil compaction.
  - Mulches can add to the beauty of the landscape by providing a cover of uniform colour and interesting texture to the surface.
  - Mulched plants have more roots than plants that are not mulched, because mulched plants will produce additional roots in the mulch that surrounds them.

6.3 How to Apply Mulch

- Before applying any type of mulch to an area, it is best to weed the area. Spread a layer of mulching materials generously around the plants. Keep mulch 2 to 3 inches away from the stems of the plants. This will prevent decay caused by wet mulch.

6.4 How Deep to Mulch

- The amount of mulch to apply depends on the texture and density of the mulch material. Many wood and bark mulches are composed of fine particles and should not be more than 2 to 3 inches deep. Excessive amounts of these fine-textured mulches can suffocate plant roots,

resulting in yellowing of the leaves and poor growth.

- Coarse-textured mulches such as straw, allow good air movement through them and can be as deep as 4 inches. A depth of 4 inches will stop weeds growing.
- Mulches composed of shredded leaves should never be deeper than 2 inches because they tend to mat together when wet, thereby restricting the water and air supply to the plant roots.

6.5. Mulching and Adding Bio-Plant

- Mulch the soil around the sorghum plants to control weeds. If you mulch, it is beneficial to spray Bio-Plant on the mulch around the sesame plants (without touching the leaves) every 30 days until the plants become too dense.
- Extra Bio-Plant should be added monthly either by spraying it on the mulch around the base of the plant, or by applying it in the form of bio-compost made with Bio-Plant. Extra bio-compost should be added as the flowers appear and then every 30 days.

A sorghum field mulched with straw.

- If the farmer uses drip-feed pipes, the Bio-Plant could be fed through the pipes. It is better to spray Pro-Plant, though, because it coats the leaves with micro-organisms, which protect the sorghum from fungal diseases.

7. How to Control Weeds

7.1 Mulch the Sorghum Fields With Dead Plant Foliage

Mulching increases crop yield, Nitrogen, and reduces weeds significantly. It involves covering the soil surface with very large amounts of plant foliage, such as rice straw. It improves the soil's properties and reduces weed problems. Good sources of mulch materials are foliage from leguminous plants, rice straw or husks, coffee hull, and crop and weed residues. Maize stubble is usable, but it takes a long time to rot.

Residues of Sorghum and Sudan Grass being used as mulch for the next crop.

7.2 Plant Sorghum in Association With Other Crops

- You can also reduce weed problems by inter-cropping sorghum with other crops at planting. The following intercropping practices have been found to be more beneficial financially than a sole crop of sorghum even under drought or excessive rainfall.

  Sorghum + Red gram (pigeon pea) 2:1 ratio
  Sorghum + Groundnut 2:4 ratio
  Sorghum + Soybean 4:2 ratio
  Sorghum + Sunflower 4:2 ratio
  Note: 2:1 ratio indicates 2 rows of sorghum and one row of the other crop.

Sorghum intercropped with groundnut.

- Sorghum + Groundnut intercropping is recommended to farmers to meet the fodder needs of cattle and other animals.
- Intercropping sorghum with cowpea, pigeon pea, field bean (lab-lab bean), and black gram have also been found to be very beneficial for weed suppression.