CHAPTER-2

BIODYNAMIC AGRICULTURE

Biodynamic agriculture is a form of alternative agriculture very similar to organic farming, but it includes various esoteric concepts drawn from the ideas of Rudolf Steiner (1861–1925). Initially developed in 1924, it was the first of the organic agriculture movements. It treats soil fertility, plant growth, and livestock care as ecologically interrelated tasks, emphasizing spiritual and mystical perspectives.

Biodynamic has much in common with other organic approaches – it emphasizes the use of manures and composts and excludes the use of artificial chemicals on soil and plants. Methods unique to the biodynamic approach include its treatment of animals, crops, and soil as a single system, an emphasis from its beginnings on local production and distribution systems, its use of traditional and development of new local breeds and varieties. Some methods use an astrological sowing and planting calendar. Biodynamic agriculture uses various herbal and mineral additives for compost additives and field sprays; these are prepared using methods that are more akin to sympathetic magic than agronomy, such as burying ground quartz stuffed into the horn of a cow, which are said to harvest "cosmic forces in the soil."

As of 2016 biodynamic techniques were used on 161,074 hectares in 60 countries. Germany accounts for 45% of the global total; the remainder average 1750 ha per country. Biodynamic methods of cultivating grapevines have been taken up by several notable vineyards. There are certification agencies for biodynamic products, most of which are members of the international biodynamic standards group Demeter International.

No difference in beneficial outcomes has been scientifically established between certified biodynamic agricultural techniques and similar organic and integrated farming practices. Biodynamic agriculture lacks strong scientific evidence for its efficacy and has been labeled

a pseudoscience because of its overreliance upon esoteric knowledge and mystical beliefs.

2.1Good agricultural practices in cultivation of medicinal plants including Organic farming

India has a rich heritage of plant based healthcare systems like Ayurveda, Unani and Siddha with a very high degree of societal acceptance. There is a global upsurge in the use of traditional and complementary systems of medicine. This is primarily due to the fact that these systems of medicine, being largely plant based, are generally safe, efficacious and affordable. The increasing demand of natural/herbal products world over, therefore, creates a need not only for conserving medicinal plants in-situ but also their cultivation outside the forest areas in public and private lands. Forests have been the main source of the raw material used in the manufacture of Ayurveda, Siddha and Unani medicines. But concerned has been raised that unsustainable collection from the wild has resulted in a large number of species entering the red data book. The Department of AYUSH, through the schemes of the National Medicinal Plants Board (NMPB), has launched major initiatives to promote cultivation of medicinal plants and thereby integrate medicinal plants into the farming systems. The major challenges facing growth and outreach of the traditional/herbal medicinal products are their quality, safety and efficacy. This inter-alias is dependent on the quality of the raw material used in the manufacture of the finished product. The National Medicinal Plants Board (NMPB), Department of AYUSH has prepared India specific guidelines on Good Agriculture Practices (GAPs) on the pattern of Good Agriculture and Field Collection Practices (GACPs) developed by the World Health Organization (WHO) for medicinal plants. In the preparation of this standard assistance has been taken from Good Agriculture and Collection Practices (GACPs) developed by the World Health Organization (WHO) in 2003 and Good Agricultural Practices enunciated by the GLOBALGAP Secretariat which is being

implemented in over 80 countries. The requirements given in this standard are subject to the following statutory and regulatory provisions-

a. The Drugs and Cosmetics Act and Rules (as amended up through 30th June 2005. New Delhi: Department of Health. 2005. Schedule T: Good Manufacturing Practices (GMPs) for Ayurveda, Siddha and Unani Medicines.

b. The Ayurvedic Pharmacopoeia of India, 5 Volumes, Ministry of Health and Family Welfare, Govt. of India, New Delhi, 1989-2005

c. The Siddha Pharmacopoeia of India, Part I (1), Ministry of Health and Family Welfare, Govt. of India, New Delhi, 2007.

d. The Unani Pharmacopoeia of India, Part-I, Ministry of Health and Family Welfare, Govt. of India, New Delhi In preparation of this standard.

2.2 Pest and Pest management in medicinal plants

Pest

In the plant world, pests refer to harmful organisms that latch on to plants, rendering them unsuitable for harvest. While most of these organisms tend to be insects, some fungi or plants can also be classified as pests. Every garden is prone to pests. Some organisms are harmless but the majorities are detrimental to a plant's roots, leaves, and overall health. This is why it is important to carefully prune plants and adopt the necessary precautions for proper pest control.

Pest management

Effective pest management depends on the accurate identification of the pest. Insects and mites often are associated with specific plants, and they follow certain development and behavior patterns as the season progresses. Use reference books from the library or garden

center to identify pests. If you can't find an accurate description there, consult someone in your local extension office. Learn about the insect's life cycle, behavior, and natural enemies.

Plant diseases may be caused by pathogens including fungi, nematodes, bacteria, or viruses. Each pathogen is capable of infecting only certain plants. Infection occurs under particular environmental conditions, with symptoms of the disease appearing later. To identify plant diseases accurately, compare visible signs and symptoms of the disease with descriptions in reference books. Some diseases are more difficult to identify, and you may need a laboratory analysis or the help of an expert. These services are available through landscape professionals or your local extension office.

Determine if a Control Measure is needed

Determine if the damage is severe enough to justify a management tactic. Is the damage actually affecting the health of the plant? If not, does it make the plant look bad enough to detract from the appearance of your landscape? You may become alarmed if you notice that caterpillars are making holes in leaves, but if the damage is slight or occurs late in the season, you probably won't need to control the caterpillars.

Are the pest's natural enemies present? In most cases, they will be. If so, an application of a nonselective insecticide could kill them, allowing the pest population to rebound uninhibited by predators and parasites, which may have been providing significant control.

Choose a Method

If a control is needed, consider physical or bio rational methods first. If they are unavailable or impractical, you may need to carefully use a conventional chemical control.

Physical methods

Pests can be removed from plants physically. For example, some aphids and mites can be knocked off by spraying the plant with water. Bagworm larvae can be picked off an infested plant.

You can use traps to catch certain pests, and barriers to protect plants from insect attack or disease infection. One effective method for controlling gypsy moth larvae on small numbers of trees is to put a band of folded burlap around the tree trunk to provide an artificial resting site for the caterpillars, and then destroy the caterpillars that gather there. Applying an anti-transpiring spray to lilac leaves in summer to prevent infection by the spores of powdery mildew is another example of a protective barrier.

In some cases, the best solution may be physically removing the plant and replacing it with one that will not be affected by the pest or disease. Thinning crowded plants to improve air circulation can reduce many disease problems.

Bio rational methods

Bio rational methods can be divided into two groups. The first group includes living organisms that can kill the pest. The second group includes naturally occurring bio chemical’s that are harmful to the pest yet often are harmless to other living organisms.

Insect pests frequently have natural enemies that are beneficial to the landscape. These beneficial insects often exist in the landscape naturally, but they also can be introduced. "Beneficial’s" may be predators or parasites. One common example of a beneficial predator is the lady beetle. Both the larvae and adult lady beetles eat aphids and other soft-bodied insects. Other predators include lacewings, spined soldier bugs, flower flies, and spiders. Parasites live on and often kill another organism, called the host. Some parasitic wasps use

caterpillars, whiteflies, aphids, and soft scales as hosts.An example of a method that uses a naturally occurring biochemical is the bacterium Bacillus thuringiensis. Bacillus thuringiensis contains a protein that is poisonous to specific insects, yet harmless to other organisms. Bt can be sprayed on plants. When the sensitive insect pest feeds on the sprayed leaves, it will ingest the protein and be killed.

2.3 **Bio pesticides/Bio insecticides**

Bio pesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals. For example, canola oil and baking soda have pesticidal applications and are considered bio pesticides.

Classification of Bio pesticide

Bio pesticides fall into three major classes-

1. Biochemical pesticides are naturally occurring substances that control pests by non-toxic mechanisms. Conventional pesticides, by contrast, are generally synthetic materials that directly kill or inactivate the pest. Biochemical pesticides include substances that interfere with mating, such as insect sex pheromones, as well as various scented plant extracts that attract insect pests to traps. Because it is sometimes difficult to determine whether a substance meets the criteria for classification as a biochemical pesticide, EPA has established a special committee to make such decisions.

2. Microbial pesticides consist of a microorganism (e.g., a bacterium, fungus, virus or protozoan) as the active ingredient. Microbial pesticides can control many different kinds of pests, although each separate active ingredient is relatively specific for its target pest. For example, there are fungi that control certain weeds and other fungi that kill specific insects.

The most widely used microbial pesticides are subspecies and strains of Bacillus thuringiensis, or Bacillus thuringiensis. Each strain of this bacterium produces a different mix of proteins and specifically kills one or a few related species of insect larvae. While some Bacillus thuringiensis ingredients control moth larvae found on plants, other Bacillus thuringiensis ingredients are specific for larvae of flies and mosquitoes. The target insect species are determined by whether the particular Bacillus thuringiensis produces a protein that can bind to a larval gut receptor, thereby causing the insect larvae to starve.

3. Plant-Incorporated-Protestants (PIPs) are pesticidal substances that plants produce from genetic material that has been added to the plant. For example, scientists can take the gene for the Bacillus thuringiensis pesticidal protein and introduce the gene into the plant's own genetic material. Then the plant, instead of the Bacillus thuringiensis bacterium, manufactures the substance that destroys the pest. The protein and its genetic material, but not the plant itself, are regulated by EPA.

Advantages of bio pesticides

- Bio pesticides are usually inherently less toxic than conventional pesticides.
- Bio pesticides generally affect only the target pest and closely related organisms, in contrast to broad spectrum, conventional pesticides that may affect organisms as different as birds, insects and mammals.
- Bio pesticides often are effective in very small quantities and often decompose quickly, resulting in lower exposures and largely avoiding the pollution problems caused by conventional pesticides.
- When used as a component of Integrated Pest Management (IPM) programs, bio pesticides can greatly reduce the use of conventional pesticides, while crop yields remain high.

Bio-insecticides

Bio-insecticides are organic formulations recommended for the management of insects that feed on crops. They are different from chemical pesticides in several ways. They contain live bacteria that produce toxins which cause stomach poison in the insects and kill them.